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PUBLIC HEALTH

PAPERS AND REPORTS

VOLUME XXIV

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American Public Health Association

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PRESIDENT'S ADDRESS.

By Prof. CHARLES A. LINDSLEY, M. D.,

Secretary State Board of Health, New Haven, Connecticut.

Mr. President, Ladies and Gentlemen—Complying with a custom which has become imperious by established usage, I now offer the formality of a President's address. I would gladly spare you this infliction, if I dare break the chain which has heretofore contributed so much to your welfare, and from which you will yet receive so much in the future. I can therefore only beg your indulgence with such patience as you may have.

I take the occasion to express in simplest phrase my sincere appreciation of the distinguished honor you have conferred upon me, and through me upon the little State of Connecticut, in giving its Secretary of Health the proud eminence of presiding over the largest and most influential body of sanitarians in the world. The State Board of Health of Connecticut contemplates with much satisfaction this recognition of the position it holds, as an active co-worker among many similar organizations, in the great cause of public hygiene.

Permit me also to congratulate the Association in being invited to hold its annual meeting in this beautiful gem of a city, whose natural attractions and wondrous scenic beauties of land and water are so fittingly enhanced by its expansive and elaborate parks; its magnificent illustrations of gothic architecture, in its public buildings; and not least, in its intelligent attention to public sanitation, as found in its admirable system of drainage and sewerage, its broad and cleanly streets and its bountiful supply of excellent water.

It is significant that three times within a dozen years the American Public Health Association has been welcomed with cordial greetings to hold its meetings on Canadian soil. It is significant of that inseparable bond of sympathy between those of kindred blood, and it is prophetic, too, of the time when the Union Jack of Her Gracious Majesty, and the Stars and Stripes of the American Union, shall be furled together, as the emblems of two great nations of the earth which stand, each pledged to the other, for the defense of human rights and universal peace.

The present is a timely and fitting occasion to pay a passing tribute to the memory of one who was for so long a time a co-worker with

us, but who soon after our last meeting in Philadelphia, rested from his labors and has gone to his reward. The venerable form and patriarchal features of the late Dr. J. Berrien Lindsley were familiar to most of the members of this body. For more than twenty years he was a regular attendant upon our gatherings, and for a good part of the time was our Treasurer. He was always an active, zealous and practical sanitarian; and in many directions his life work has been so prominently devoted to the welfare of his fellowmen that there are few who deserve more justly the title of philanthropist. He went about doing good. He was the type of man of which England's poet laureate sang—"He wore the white flower of a blameless life, and bore without abuse the grand old name of gentleman." While we revere his memory may we emulate his virtues.

I have also to mention two others, who have been called from our ranks during the past year—Dr. R. M. Swearingen, of Texas, and Dr. F. H. Bodineus, of Wisconsin.

Ladies and Gentlemen—The primary and ultimate purpose of this Association is the protection and preservation of the public health. Or, as more definitely expressed in our constitution,—"The advancement of sanitary science and the promotion of organizations and measures for the practical application of public hygiene."

Sanitary science, like all other sciences, is based on the correct interpretation of facts. The verification of a single fact often involves a long investigation. For example, there is such significance in the fact that, civilized man lives longer than the savage, that it has arrested the attention of close observers, and prompted inquiry into the special factors in civilization which have caused that result.

The most superficial investigation shows clearly that all the conditions of life attendant upon civilization do not equally promote longevity, but on the other hand, some of them are distinctly prejudicial to length of life. As the inquiry proceeds it grows complicated, but more interesting. Civilization is a power exerting an influence upon human life in many directions. It is the part of man as an intelligent being, controlling in a measure his own destiny, to so direct the progress and development of civilization that the good shall ever more and more predominate over the evil, and tend to his permanent elevation and prosperity.

It will be readily appreciated how some of the conditions of modern civilization may contribute powerfully to lengthen life, if the average of a large community is the basis of measurement, and equally intelligible how other of the social practices of so-called civilization may prematurely cut the thread of life, and so diminish its average dura-

tion. It is one of the purposes of this Association to study such influences, to direct and control them.

To illustrate briefly, we readily recognize the saving of infants by the more intelligent care bestowed upon those of tender years than upon the offspring of barbarians.

Again, consider how much the lives of the aged, the sick, and infirm are prolonged, by care and help, long after they would be capable of self-protection and maintenance in savage life.

Still again, consider how science, as a product of civilization, has stamped out the fatal epidemics of former times. We no longer fear those terrible pestilences such as, 500 years ago, swept off half the population of Christendom.

What wonderful achievements civilization has accomplished in this direction!

Notice the deadly maladies which all of you have heard of, but which few if any of you have seen, because they have disappeared, positively disappeared, under the influences of the civilization that *we* enjoy.

There are not many members of the medical profession even, at the present time, who have had personal observation of the plague, of leprosy, of scurvy, of typhus fever, of yellow fever, and I may almost add of small-pox. Yet these were the maladies which in former times so often made the graveyards fat.

Again, you are yourselves witnesses of the steady gain in the control of almost all other contagious and infectious diseases. Note the lessened prevalence of typhoid fever, and of that supreme destroyer, pulmonary consumption and its congeners. Remember the victories already won by serum-therapy and the reasonable promise it gives of future triumphs. And do not forget how by reason of the sovereignty of disinfectants over pathogenic germs, the surgeon can boldy invade the most vital organs of the body and triumphantly rescue his patient from the grasp of the destroyer.

In the light of such facts it cannot be denied that in the present age of human existence, as compared with any historic past age, civilization has prolonged the average life of man. But this conclusion does not settle the whole question of the true relation of civilization to longevity. Although up to the present date the effect of civilization as a whole, has been conducive to length of days, it cannot be taken for granted that it will continue to produce the same result during an indefinite future.

Civilization is an evolution. It is progressive, developing new features with every advance. As the social problems of life increase,

they become more complex. Man is, to some extent, both the creator and the creature of his own environment. The environment which is the result of civilization is not always in accord with the laws of health.

Whenever they are in conflict, man is sure to suffer. The laws of nature are inflexible and immutable. Altered conditions of living, the concentration of populations in cities, the developments of science, the cultivation of new arts, which add to the comforts or the necessities, or the luxuries of life, often entail new causes of disease and new agencies by which the careers of men are shortened.

Health organizations are, themselves, a development of civilization.

Civilization is not a distinct entity. It is not a constant condition. It is a process, always unstable, ever striving for advancement, a continuous experiment, never to be completed. Civilization is the unceasing operation of that intelligence with which man is gifted, exerting itself to change his present environment, whatever it may be, in the hope of promoting still more his personal comfort and of increasing his sources of enjoyment.

The contrast between the man-savage and the man-civilized is one of the most remarkable phenomena in nature. The extreme types of the two states do not find a parallel elsewhere in all animated creation.

The savage is closely assimilated, in habits and practices, to the brutes; like them from day to day wresting his subsistence from such sources as nature affords at hand; hovelled in huts or caves, and rudely clothed in skins, or even unclothed if the climate permits; gregarious rather than social; whose community organizations might often be improved by taking lessons of the industrious ant or the domestic honey bee.

On the other hand, what possible resemblance exists in the foregoing type of the genus man, to those persons who represent the cultivation and the refinement, and who enjoy the comforts, the luxuries and the enobling incentives of modern civilized life. Yet the wide expanse which divides these two extremes, each from the other, is measured, not so much by marked changes in physical organization, as by the effects which civilization has wrought upon the moral and mental nature of our species. The corporeal system of the savage, his lungs, his heart, his liver, his kidneys, his stomach, are not inferior in organic structure and functional vigor, or in powers of endurance to those of the civilized man. As representing more closely the survival of the fittest, the savage at maturity has even a better promise of longevity than the average of those, some of whom by cautious and prudent care, are representatives, not of the fittest in a physical sense, but also of many feeble and sickly persons who by careful nursing

have survived, and also of many who, by the debilitating practices and vices of civilization, have become weakened and effeminate.

Indeed so potent for evil consequences are these latter influences that the question is already discussed: Does civilization tend to the extermination of our race?

Some historian has written that in the 11th century man had only two chief desires. One, not to be killed by his enemy, and the other, to have a good tough leather coat. Since that period the desires of man have multiplied.

One of the most prominent tendencies of civilization, as contrasted with barbarism, is to sociability. Observe how much the habits, the customs, and the aims of modern life are controlled and directed by social considerations. Recall to mind the theatres, the lecture halls, the other places of public amusement, the social club organizations, the innumerable fraternal associations, the structure and arrangement of our homes even, the conventional forms in use in personal intercourse in what is called polite society; all these testify to the social tendency; but more significant and important than all is the steadily increasing aggregation of population in cities. Civilization is formed and fostered in cities. The manners and habits of life in cities is the highest illustration of civilized life. In cities also it exhibits most powerfully its influence upon man's well being, intellectually, morally and physically. The present occasion only permits considering its effect upon health, longevity and mortality.

We have already made brief allusion to those factors in civilization which promote the duration of life. But when we come to deal with those phases of it, which influence life in the opposite direction, we are brought in immediate relation with many of the conditions which demand modification and control, by associations like ours and other sanitary organizations.

We have said that in cities civilization is formed and fostered. So too in cities the evils attending civilization are most fully developed and give most occasion for direct and organized effort to counteract or prevent them.

The concentration in cities of dense populations, is in itself a prolific source of influences, potent in the destruction of health and life. The Roman poet has well and truly said: *"Pericula mille saevae urbis"*—A thousand perils beset the great city. A marked difference in the influence of urban and rural life on their respective populations has long been noticed, and could easily be verified by statistical quotations. But I have a respectful regard for your patience and will not subject your forbearance to the test of figures. I can satisfy you

with testimony from another source. Hear ye what the philosopher and poet, Cowper, says:

"But though true worth and virtue in the mild
And genial soil of cultivated life
Thrive most, and may perhaps thrive only there,
Yet not in cities oft: in proud and gay
And gain devoted cities. Thither flow,
As to a common and most noisome sewer,
The dregs and feculence of every land.
In cities foul example on most minds
Begets its likeness. Rank abundance breeds,
In gross and pampered cities, sloth and lust,
And wantonness, and gluttonous excess.
In cities vice is hidden with most ease,
Or seen with least reproach."—COWPER.

And listen to another tribute from the same pen to the salubrity, both moral and physical, of the country over city life:

"God made the country, and man made the town.
What wonder then that health and virtue, gifts
That can alone make sweet the bitter draught
That life holds out to all, should most abound
And least be threatened in the fields and groves?"—COWPER.

The foregoing reflections lead directly to the plain and evident conclusion, that the real field of work for the practical sanitarian is closely restricted to communities, and to large communities. It is in dense populations that vice, poverty, crowd-poisoning, epidemics of contagious diseases, and the extremes of wretchedness, want and ignorance do most abound. There are the battlefields where the contests with the health-destroyers are to be waged. In every well organized community, whether it be village, town, city or state it should *not* be an optional matter, to do or to leave undone, the duty of conflict with such agencies as are known to be hostile to the general public health.

The principle of protecting and promoting the general welfare, at the public cost, is recognized and acted upon in many ways. For the protection of property and the rights of persons we organize a police system and establish courts of justice at the common expense. We establish and provide for a fire department to protect our buildings. We make and keep in repair the public highways. We establish schools for the education of our children. We build alms houses for our poor, hospitals for our insane and prisons for our criminals. It is recognized more and more every year that the protection and preservation of the health of the people, and a due regulation of the matters which concern their health, is not less an important duty and function of government.

Public sanitation is rapidly taking an acknowledged position among the exact sciences. Some of the best minds in the scientific world are giving earnest attention to the further development of it. In fact *the science of public sanitation is now well in advance of its practical application.* The pressing problem of the day is how can we most effectively and successfully make it an *applied* science?

By what machinery of official procedure can we most successfully use the knowledge which has been acquired, for the improvement of the public health? It is well known to this audience that until a very recent period the administration of public hygiene throughout America has been, and still is, in most places extremely crude, slovenly and unsystematic. In many states of the Union each community pursued its own independent and individual methods, if it pursued any at all, quite regardless of the methods of its neighbors. However wisely and energetically, in a few scattered instances, the public may have been served, the sum total of good realized has not yet impressed the popular mind with a just and true sense of the importance of the subject. In far too many instances, wasted energies, fruitless efforts, incoördinate attempts, spasmodically made, have produced only atrophied and asthenic results, which if not entirely nugatory, were often by misdirection as harmful as beneficial to the public health. Except in a very few instances the best methods of practical sanitation for the people are yet to be adopted in America. England leads all other countries in public sanitation.

It goes without saying that organized systematic methods are absolutely essential to any satisfactory results. The system must necessarily be flexible enough to be adapted to the varying circumstances and conditions of the communities in which it is to operate. The jealously guarded independence of cities and incorporated villages will doubtless for a good while obstruct that unity of purpose and concert of action which are so necessary to the accomplishment of the best results over a larger territory. But in whatever way the improvements which are so desirable may be brought about, it will be by progressive steps. It will not be an event, occurring suddenly, but it will be a growth, the progress of which will depend largely upon the intelligence of the communities who receive its benefits. It may even happen that the independence of incorporated communities and the pride of "state rights" instead of retarding may hasten progress. Because all important cities and many of the states are appreciating more and more the indispensableness of sanitary administration, and as the practice increases and longer experience suggests improvements, it will surely become evident that no single city or state, can enjoy the utmost advantages of sanitary administration unless the ad-

jacent territory has also a good system of health ordinances and health observances.

The boundaries of sanitary and unsanitary districts have no respect for town lines or city limits. A town or city may itself be governed under the most commendable health laws, and yet its citizens may suffer from the undrained lands of an adjoining town or be subject to the serious calamity of the deposit of the sewage of another town just outside of its own borders; or its water supply may be defiled by the filth of distant towns located upon its tributaries. Over these and such like insalubrious conditions its own local laws have no authority. Yet such conditions are not rare. When the people begin to appreciate them, and to inquire how they may be remedied, then is the opportunity of the sagacious health officer to stimulate and utilize the public interest and sow the seeds of hygienic knowledge. It is the true policy of boards of health to lead the people—to show them what they want and how to get it—not to wait to be led by them. Show them the way. We often speak of persons as 100 years behind the times. So too there are persons as far ahead of the times. They may be theoretically, even scientifically right, but such are not good leaders. They are not practical. Good leaders never get so far ahead of their followers as to be out of sight. They must keep in touch with the people.

I allude to these points because an ideal sanitary administration implies so much that is required of the people, and so much special sanitary legislation which can only be secured by the approval of the people. Before we can get that we must educate the people to appreciate the merits of the laws we ask for. Law itself is a good educator, but to be such it must be administered to excite the intelligent attention of the people, and commend itself to their approval, and thus increase the general knowledge of the objects for which it was enacted. When the law has the backing of the people it is a very effective educator. But when it has not the backing of popular sentiment, sanitary law is often void and of no effect. We of the United States realize this more than other nations. Permit me to quote here what I have written in another place: "So far as state and municipal legislation is concerned, public intelligence sets the pace at which progress in public hygiene can advance. It is laid down as a fundamental principle in the 'Declaration of Independence,' which is our political Bible, that all men are created equal. That the governments which are instituted among men derive their just powers from the consent of the governed." These sentiments are inculcated into the mind of the American boy with his earliest conceptions. They imbue his mental constitution. They infiltrate all his intellectual pro-

cesses. And through life they are a factor of influence in all that pertains to his personal relations with others. Hence it is by reason of this teaching and training of the American citizen that all legislation partaking of a paternal character becomes a dead letter unless approved and sustained by public sentiment. In that particular the citizen is only consistent with the precepts inoculated in him in his youth and which have incorporated themselves into the guiding thought of his daily life. Probably, elsewhere than in the United States, the same influence may be felt. The practical lesson is, that the sanitarian must not go beyond the point where he will lose the support of the public. But he may bear in mind that the people often wish for what they are told to wish for. And he may sometimes wisely tell them.

In the Provinces of Canada, in Mexico, and in many states of the American Union there are illustrations of sanitary administration approximating (as yet imperfectly), an ideal system. The prominent features are: First. A central organization, for example, a provincial or state board of health, composed of a fixed number of members and an executive officer. Second. A local board of health, or a health officer, for each town or city in the state or province. The central board is the head, the local officials are the hands. These organizations are in each instance established by special legislation. All of them are founded on the same general theory of administration. The root-thought is the same in each. But they differ from each other chiefly by reason of the different functions with which the central board is charged and the character of its relations with the local boards.

A central board is sometimes endowed with only advisory functions, possessed of no mandatory powers. Its official acts are limited to "Sanitary investigations and inquiries in respect to the people, the causes of disease, and especially of epidemics." It may also advise as to the location of public institutions and their general sanitation. Beside such duties, it is like an intelligence office on sanitary questions, at which local officers of health may apply for instruction and advice. But as the said officers are entirely independent of the central board and of each other the advice carries with it no authority. The merits of this system lie in its opportunities as an educator of the people in the principles of public sanitation. But as a working organization it is very defective—not up to the requirements of the present day—not abreast of the progress of the times. The parts of the machine are not fitted to each other, and when its use is most needed it will not be found in working order.

In other instances the central board has supervisory powers and can authoritatively direct, more or less, the official acts of the local

boards. And still other central boards are charged with both supervisory and administrative authority, in special directions.

It is encouraging to reflect that thirty years have not yet elapsed since the establishment of the first state board of health in the United States, and that at the present date about forty of the states of the Union have organized such institutions. That is progress. It is significant too that each state legislature, acting independently, has, with few exceptions, adopted a plan, so like the others, that they seem to have germinated from the same root-stock. While no two state boards of health are quite alike, yet they differ from each other chiefly in details; in fact, mostly because of a difference in the development of the fundamental principles upon which they are all based. They have all shown an inherent appreciation of the need of a central source of information, to give systematic and enlightened direction to the work, and to secure in a methodical way, the most practical and economical application of sanitary laws. These state boards have developed somewhat differently, in different states, in consequence of local influences. In some states the growth has been stunted by the mistaken economy of penurious legislatures in refusing an adequate pecuniary support. In other states the poison of party politics has polluted its life blood and condemned it to a sickly existence, prostituted to the lust of office seekers. But in many states these organizations have maintained a vigorous activity and contributed not only to the improvement of the public health for their own people, but by orginal researches have advanced and broadened the world's knowledge of sanitary science. Notably among such is the State Board of Massachusetts, which by its practical experiments on the purification of water and the disposal of sewage, deserves the gratitude of the nations for its discoveries.

Other boards are working with success on other lines. The past quarter of a century has been a period of acquiring experience—of getting and giving information on many subjects, of which at the beginning of that period, we knew but little or nothing. With the advance in sanitary science the *administration* of public hygiene has also become scientific. The experience of state and local boards of health during the last twenty-five years in administering law ought, in the coming quarter-centennial, to crytallize into some settled and established principles of practice. The outlines of these can already be partly defined. Permit me to trace a few.

It will be conceded without dispute, among those competent to judge, that the direction and control of the registration of vital statistics, for the entire territory over which its jurisdiction extends, is by right a proper function of a central board of health.

To illustrate by a parallel, one would not expect a railroad corporation to conduct its business successfully, if its accounts were kept by the Society for the Prevention of Cruelty to Animals. Nor can a state board of health conduct a successful administration of public hygiene if its bookkeeping is done by another department of the state government, or not done at all. The records of vital statistics are the account books of public hygiene. The duty of protecting the public health and keeping the records of the public health are obviously inseparable, despite the fact that they are sometimes separated. In such cases it is a defect which cannot too soon be remedied.

Sanitary administration naturally divides itself into two quite distinct kinds of official duties. One kind is local and is best performed under the superintendence of the local officers, upon whom should be placed the responsibility, and with whom the central board should not needlessly interfere. This kind of work relates to the abatement of nuisances, to the control of contagious diseases, to the inspection of food markets, of public buildings, schools, streets, alleys, and the general duties of a sanitary inspector. It has the character of a police service, and concerns only local conditions. For such the state or provincial board should have only supervisory authority.

The work is wholly in the interest of the town or city in which it is needed, and should be paid for by the residents and not by the state or province. "That state board of health does its own work the best that lets the work of others alone; that encourages and co-operates with its sister boards of charity, correction, public works and the like; not when it tries to assume their functions. It does its own work best when it encourages the local boards under it, coöperates with them, strengthens them, makes them feel their responsibility, not when it assumes their work, weakens their power and weakens their responsibility.[1]

The other kinds of official duties relate to things which affect the health of communities as a whole. For example, the source and quality of a general water supply, the drainage of drowned lands, the disposal of the sewage of towns, the location and sanitation of public buildings, the inspection of places of public resort, and the assembling and tabulation of the vital statistics. On such matters of general interest the central board should have some measure of authoritative supervision. On the last point, it should be in such close communication with all its local officers that the *sickness* of the people may be constantly reported at regular intervals, so that the origin of contagious diseases may be promptly detected and epidemics prevented or restricted.

[1] Prof. Wm. H. Brewer, Conference of State Boards of Health, 1897.

The difficulties of collecting fully and accurately the number of births, marriages and deaths and the cases of sickness in any given population have long been recognized. Many expedients have been resorted to for better results. The hindrance to success lies in this fact, to-wit: Any complete enumeration of these events is dependent upon punctual and correct reports from a large number of individuals who have no personal or official relations with each other and who are of different occupations. For births, sickness and deaths the doctors, midwives, sextons, undertakers and registrars must all contribute, each his part. For marriages the clergy of every denomination, justices of the peace, and all who are qualified by law to perform the marriage ceremony, must also report, punctually and correctly.

Voluntary obedience of the laws requiring these reports, with the necessary precision and care, by so many and such variety of persons, has never been observed in all human experience. Nothing short of compulsory obedience will succeed. It is irrational to trust to voluntary obedience of such laws. The compulsion must be constant, vigilant and uncompromising. It is surprising how easily it can be put in operation, and with what good results. In Connecticut, where your speaker has the honor to reside, we have a law, and it is not one of the old blue-laws, that the people of other states sometimes maliciously ask us about, but it is a real red-letter law, a rubrical gem. It makes it the special duty of one officer, appointed for the purpose, in every county, to execute the laws relating to public health and those relating to the registration of vital statistics. He must be a lawyer. The doctors, and the clergy, and the midwives, and the registrars, and the sextons, in every county in Connecticut, all know this officer and hold him in high respect for the faithful discharge of his duty.

Let me emphasize the statement, that *the assembling of vital statistics, demanding so many facts, from so many different people, cannot be successfully accomplished, except under special, unremitting, and authoritative supervision.* The whole experience of the civilized world is offered in evidence.

A very important and desirable advance in sanitary administration is to be made as soon as popular intelligence can be made to appreciate the value of it. I have reference to specially trained local health officers, sanitary inspectors and health officers whose services will be held in sufficient respect to command a salary adequate to their support. The officers of health shall have *been* experienced practitioners, but as health officers, shall give undivided attention to their official duties. *No physician can practice in the same community, which he serves as its health officer, without occasional conflict of personal with pub-*

lic interests. It is not for the best good of any community to subject any of its citizens to such a trial of integrity and self-sacrifice. Neither should the health officer be in professional competition with his medical brethren. That time will come, and the necessary increase of compensation for better service will prove a judicious and economical expenditure of the public funds.

I have one more suggestion to make, which is: That any state or provincial board of health, as it goes on and gains experience in its work, will feel the necessity of a chemical and a bacteriological laboratory. Several state boards have already established them and find them an indispensable appendage to their means of usefulness. A central board is not fully equipped without them.

The future of the administration of public hygiene in America is encouraging. The progress which it has made in the last two decades indicates a vigorous and healthy growth. But it is still in its early youth. Its motto from now on must be: Organization and efficient coöperation.

This American Association will continue to be, as it has been, an ever-increasing fruitful fountain of information, and as an active agent in developing the power of public opinion in aid of the cause, an influence for good which cannot be estimated.

Provincial, state and local boards of health, in organic form, are coming to be recognized everywhere as necessary forces for the safety and well-being of all civilized communities. The movement has gained an impetus which cannot be resisted. It must go on, nurtured, sustained and guided in its progress by the skill, judicious enterprise and intelligent energy (so characteristic of the people of North America), until, in practical utility and successful results, it will have no superior among the nations of the earth.

ADDRESS.

By JOHN SWEETLAND, M. D.,

Chairman Local Committee of Arrangements, Ottawa, Canada.

Mr. President, Ladies and Gentlemen, and Members of the American Public Health Association—My duties to-night will be very light and exceedingly pleasant. It is my privilege, as Chairman of the local Committee of Arrangements, to extend to you a few words of welcome, and to introduce gentlemen who will follow me in welcoming the members of the Association and their friends to Ottawa. It will be unnecessary for me to take up any of your time in dwelling upon the importance of the Association that we have the honor of entertaining in Ottawa during the present week. It is an Association which is second to that of no other that has ever visited this city. The work they have undertaken is a work that appeals to all classes of people—public health. Public health is a question in which all must be interested, and the work the members of this Association have been doing for many years is not unfamiliar to you.

It is a very pleasing incident to know that at the present time two conferences, international in character, are being held in the Dominion of Canada; the one at Quebec, composed of the leading statesmen of the United States and of Canada, are assembled for the purpose of untangling many vexed questions of trade and international law, and those little matters that are constantly creeping up along the border, and we trust and hope and believe, if we can believe what we hear of the work that is being done there, that they are going to be successful in carrying out the extension of the trade and in removing those difficulties that at times have been a source of irritation. The other convention, the one that we have the honor of welcoming here to-night, is not at all of secondary importance. I think we might safely say it is of first importance, in that it is composed of scientific gentlemen, not only of the medical profession, but in engineering, architecture, and in other scientific branches that apply to the sanitation of the country. I trust that we may be as successful in laying broad and deep foundations of health reform as those that are met in the historic city of Quebec will be in adjusting the trade difficulties. It is a happy thing to know that the people of this Continent, comprising not only the United States and Canada, but also the Federal States of Mexico, are meeting here in the Dominion of Canada, the

capital city, to legislate in the interests of the whole people. We trust that the union that is now taking place between the different sections of the Continent, those who are living under different governments, will be a union that will continue in the cause of humanity, continue in carrying out all those good works, those great works, by which the whole people are to be benefited, and that we may continue to live long in peace, to enjoy the blessings that are likely to accrue from legislation arising from so important a body. There is no reason why we should not. There is no reason why we of the great Anglo-Saxon race should not combine together to uphold those principles for which our forefathers fought, in establishing those principles of freedom, of the extension of trade, of the suppression of slavery, and in extending the good fellowship that should exist among people. I say, there is no reason why we should not be able to work together as one people for the attainment of all ends or matters that pertain to our common life. There is no reason why our friends on the other side of the line should not continue to prosper as a great Republic. (Applause.)

The proceedings to-night will largely consist of addresses. The first part of our meeting will be an address of welcome to the Association, and after this there will be the President's address.

I now wish to extend to you a most cordial welcome to the city of Ottawa. I trust that when you leave Ottawa and our Dominion, you will carry away with you kindly feelings, that you have been treated hospitably; that we have received you in the spirit that we desired. We hope that your visit may ever be remembered as one of the most pleasant that has taken place in the history of the Association. (Applause.)

ADDRESS.

By Hon. SIDNEY FISHER, M. P.,

Minister of Agriculture, Ottawa, Canada.

Mr. President, Ladies and Gentlemen—The charge is laid upon my shoulders of speaking on behalf of the Dominion of Canada to welcome the American Public Health Association within our borders. It may seem rather strange to you that the Minister of Agriculture should be charged with this office, but it happens that in our country the Department of Agriculture has charge of the quarantine service, and it is the only department of the Dominion Government which deals with the public health. It therefore becomes my pleasant duty to welcome the members of the American Public Health Association within the borders of our Dominion. (Applause.) I wish, sir, to congratulate this body on its prolonged and successful career. I understand this is now the twenty-sixth annual meeting of the Association, and I am glad also to know that it is the third of those annual meetings which you have been so good as to hold in our Dominion of Canada. It is always very pleasant for us as Canadians, to meet with our brothers, I might almost say, I think we are brothers, in the great Republic to the South of us. It is especially pleasing for us to welcome the members of this Association at a time when the bonds of sympathy, the mutual confidence and friendly relations between the Empire of which we are a part, and your great Republic (America), are so strong and so manifested. (Applause.) I wish also to welcome those who came from a greater distance, from the great Republic of Mexico, another portion of this North American continent (applause), and to express my great gratification that we, occupying here the northern border of that continent, are able to welcome to our shores and within our bounds gentlemen who came from that southern and tropical republic. I wish to make this welcome especially warm to the members of the Association who came from the sister countries, because I know that on other occasions the representatives of these countries have so warmly, so gracefully and heartily welcomed the members of the medical profession who belong to your Association when they have gone to your annual meetings in your respective countries. When the representatives of Canada have gone to the Republic of Mexico, they brought back

glowing accounts of the magnificent welcome and the kindly hospitality received there. (Applause.)

As a layman, it would not become me to say anything of a professional or perhaps scientific nature in regard to this convention. But after all, you professional men are intimately connected with the lay elements in our midst. It is for us you work. It is we who support you, and I might almost say, in regard to this particular Association, that as a member of the Government it is perhaps quite appropriate that I should be present during your deliberations and discussions to hear what you have to say, because a public health association is perhaps more intimately connected with the governments of the countries in which it exists than any other part of the medical profession. You are working in the interests of the public at large. The ordinary members of the medical profession work for individual clientele, the individual doctor for his individual patient. But the public health officers of which largely your Association consists, are working for the whole community at large, and the operations and work of your Association are essentially organized, as a general rule, under the respective governments of the countries in which the work is carried on. It is therefore appropriate that the government should be represented at your annual gatherings, and while you are here, in order to get the benefit of your deliberations. There is one thing also which I might venture as a layman to remind you professional gentlemen of in your work for the public health, namely, to advocate and arrange practically the laws of the various countries in regard to sanitation, hygiene, and the public health. You naturally follow the scientific truths which you have discovered, and desire to carry out the necessary regulations to the utmost extent, as indicated by the science which you have studied. It is right and well that that should be done. It is well that we should know exactly the best thing possible to protect and preserve the health of our people, and that any regulations which are issued by the governments to benefit the nation should be at our command. But we must remember, and I would ask you not to forget it, that after all regulation and law are not only to be passed by the powers that are, but are to be accepted and be acceptable to the whole people affected by it. No law can go beyond the public opinion which has to support and sustain it; therefore, I must ask you gentlemen in your scientific investigations and in the practical application of those scientific investigations to everyday work, or the regulations which are framed upon them, to remember that the great public is to be considered and taken into account, and that those regulations must be practically acceptable or they will not

do the good which your scientific information might expect you to attain by them.

There is just one other thought I will refer to before leaving you. It is said, that an ounce of prevention is better than a pound of cure. I must congratulate this organization that it is one of prevention. It is an organization by which the evils which flesh is heir to will be prevented, and we will escape from those diseases we see so frequently stalking about in our midst. By reason of sanitation, by reason of proper hygienic precautions, we ought to be almost free from disease, and it is possible that your Association in the course of time may do so much towards prevention that other doctors will be unnecessary. (Laughter.) I am not sure that would be altogether popular; I am not certain the world at large would be willing to dispense with the other doctor. The family doctor is always a welcome guest, and we would be deprived of a great deal of social pleasure were the doctors generally to be dispensed with. But at all events, even if the other doctors are dispensed with, we shall always have with us the Public Health Association and its members, and we shall have that consolation.

I trust the meeting taking place here will give us a great deal of assistance in sanitary and hygienic work in our relations with the Dominion and its Provinces, as well as the various municipal organizations of Canada. Sanitation is an important study, one in which the individual is interested as well as the people at large. It is therefore a great privilege for us, here in the city of Ottawa, to welcome this Association to our midst and to be able to listen to and read of the work which you are going to carry through.

In the name of the people of the Dominion, and as Minister of Agriculture, occupying a position in which the public health is concerned, I have great pleasure in welcoming you to our country. (Loud applause.)

ADDRESS.

By Sir JAMES GRANT, M. D., K. C. M. G., F. R. C. P. (Lond.),
Ottawa, Canada.

Mr. President, Ladies and Gentlemen—It is to me a source of pride and gratification to have the pleasure of extending to you to-night a word or two of welcome. Your meeting is great in its character. The Honorable Minister of Agriculture has announced that you have met in Canada three times, twice previous to the present time. This is the first occasion in which you have assembled in the Capital of the Dominion of Canada. During the past quarter of a century, in no department of science has greater progress or advancement been made than in sanitary science. In 1873, when I had the pleasure of listening to the inaugural address of the late Dr. Bowditch, of Boston, at Washington, in which he took a most comprehensive view of the importance of this whole subject, the impressions made on that occasion and the information disseminated throughout the wide world, were very deep. He struck the keynote that has placed sanitary science to-day on that important foundation on which it rests. He announced at that time that no less than two hundred thousand people were slaughtered annually, in the great American Republic, by inattention to preventable diseases. Mr. Simon, the great sanitarian of England, almost about the same time, stated the mortality in Great Britain was one hundred and twenty thousand annually, and Dr. Farr, the greatest statistician on the subject of public health that ever lived, stated the mortality in Great Britain reached fully a hundred and fifty thousand annually. When we consider this mortality, and that it arises from diseases that are purely preventable, is it any wonder that the sanitarians of the great American Republic should co-operate with those in the same department in Canada, and other countries, for the purpose of improving the health and happiness of our people? We know perfectly well that since the address of Dr. Bowditch, associations have been formed in a great many states of the American Republic, and are now carrying on active and energetic work, with the most practical results. And I am glad also to announce to the members of the American Public Health Association that the Province of Ontario has been up and doing in the past twenty-five years. The Government of Ontario has exercised its power and ability in the formation of a Bureau of Public Health, and they have quietly and judiciously examined into the wants and requirements of our people, throughout the length and breadth of the Province, and Dr. Bryce, as

its Secretary, is worthy of the highest commendation, for the efforts that he has put forth, to establish healthy improvements in this Province. If we inquire to-day what they have done, we have only to look at the records published annually; thus has disease been stayed. Look at our people; do they give indications of decay and decrepitude? Very far from it. We know perfectly well that the great disease which we have in Canada to-day, and which you will find inscribed on the tombstones, is "old age." (Laughter.)

In Canada we have many educational institutions, and it was my duty twenty-five years ago, when the President of the College of Physicians and Surgeons of Ontario, to insist with the other members of that worthy body, in having a department of sanitary science introduced into our universities and taught there as one of the requirements of medical education. And such it is to-day, not only in our universities, but also in our public schools and institutions, we find one of the largest departments attended, is that of sanitary science. Having just returned from the great Congress of the British Medical Association, at Edinburgh, let me tell you that one of the subjects which engrossed the greatest amount of their attention was that of sanitary science. The two questions taken up particularly were the pollution of rivers, the dissemination of tuberculosis, and other points pertaining deeply to sanitary science. We find that the subject of tuberculosis to-day is engrossing the attention of the entire medical world. Professor Bryce, in his recent address to the Province of Ontario, has pointed out that within the last twelve months there was a remarkable decrease in mortality. And let me tell you here to-night, that in Great Britain there is no subject now being more thoroughly and carefully discussed than that of milk, in order to ascertain whether the tuberculous animal, that produces milk, as an article of nourishment communicates the disease to the human family. This is a subject of vast importance, and so it has struck the public mind, that the various sanitary associations to-day are insisting upon the ferreting out of herds of cattle, that produce tuberculous milk, having these cattle examined at stated intervals, by a thorough veterinary surgeon, to determine whether or not there is the development of tuberculosis in the slightest degree. It is only in this way that we can guard public health and watch over the necessary requirements, in order to maintain vitality in our midst.

There are some other points upon which I should like to say a few words this evening. Our worthy Minister for the Department of Agriculture has mentioned this evening a subject which is to me of very great moment indeed. He speaks of the improvement of public health and how much the Dominion Government is interested in it.

Well, let me say to-night that the medical men of Canada for years past have been endeavoring to impress upon the minds of the public men of Canada, the importance of public health study, so as to guide and direct the health of the people, not of any one province, but of the entire Dominion, from the Atlantic to the Pacific. We felt there was no subject to-day which should engross the attention and careful observation of those in charge of the government of our country more than the establishment here in the Capital of Canada of a Bureau of Public Health. (Applause.) We know perfectly well that the importance of this subject has been impressed upon the minds of the public men in the American Republic, and I trust the day is not far distant when those who guide and direct the interests of this country will see that it is incumbent upon them to take into serious consideration the formation of a Bureau of Public Health, to give the people of Canada an adequate return for the exercise of mental and physical power exercised in the development of the best interests of Canada. (Applause.)

One other point is this, and I am sure you will agree with me: Sanitary science as a whole has done a great deal for our people. We know the mind exerts a powerful influence over the body. When the mind is healthy, we also have a healthy body; and when we see now in every public demonstration in the great American Republic, as well as in the Dominion of Canada, the two flags, American and British, blended together, it is an indication of the happiness and prosperity of our people; and you may rely upon it, that if the health of our people is directed along this course, it is evidence of a condition which I trust will long continue.

I am extremely pleased and gratified that so many members of the learned professions have come to Canada in order to see what kind of people we are. You may rest assured that while you are here we will extend to you a hearty welcome, not only to this Province, but to every portion of it, as indicated by the worthy Minister of Agriculture who has preceded me. And to the gentlemen from Mexico, I trust that great country, which we know takes an important interest in sanitary science, as well as in other sciences, let me say that I hope this is not the last time that we shall have an opportunity of welcoming them to Canada. We wish you a happy sojourn here, and a safe return to your homes. May this visit to our Dominion be one that will make a deep impression, not only upon the people of Canada, but Mexico and the neighboring Republic in the advocacy of the subject of sanitary science, which is so intimately associated with, the welfare of the people of this world. (Loud applause.)

ADDRESS.

By His Worship, SAMUEL BINGHAM, Esq.,

Mayor of Ottawa.

Mr. President, Officers, Ladies and Gentlemen of the American Public Health Association—As Mayor of the city of Ottawa I welcome you in our midst. Ottawa, the Capital of our great Dominion, through me, extends to you her hearty greetings of welcome, and openly and gladly confesses that she feels honored by your visit. It is no common occurrence to have assembled together, for such a goodly purpose, so many gentlemen, so well gifted by nature and so thoroughly fortified by learning and research to pronounce upon matters so dear to one's country and to one's home, and so precious to all of God's children, and so we, the citizens of Ottawa, fully realizing the importance of your visit, the good that will flow from it, and the benefit that humanity at large will derive as a result of your united, publicly expressed views, grounded on scientific precepts and filled with the advanced knowledge which you have to date acquired, upon sanitary matters which are of vital importance to country, home and person, unitedly and freely and proudly bid you welcome to Ottawa.

Mr. President, officers, ladies and gentlemen, twenty-seven years ago, your Association was in its infancy, but like the good that has universally spread as the result of your labors, it has thrown out its arms and called to its membership, representatives from federal, state, provincial and municipal services, from the medical profession, from the scientific men of universities and colleges, and from the great body of the public; and, although it was at its inception an honor of no small degree to be a member of your valued, valuable and necessary Association, it is to-day an honor of honors to be enrolled in your ranks as a member and a privilege which the greatest intellects in the land should seek to possess and to unhesitatingly consummate. That Ottawa will add her quota to your ranks, I fear not. Her citizens, renowned for their generosity and public spirit, and her public, scientific, and professional men being noted for their ever readiness to be with, and of these who are engaged in the good work of bringing comfort and enjoyment to as many as possible, and being always awake and on the alert and anxious to further any cause by the furtherance of which the country's welfare will be benefited, are sure to

step to your side and announce their readiness to render you, in the carrying on of your good work, such assistance as they can possibly give.

Those who have made themselves acquainted with the valuable services which you have during the twenty-seven years of your existence as an Association, rendered not only to the United States but to the world at large in matters of preventing the introduction and spread of diseases, in circulating sanitary knowledge for the good of the state, the home and the individual, in providing means to have the pain of the afflicted lessened, in reducing the rate of mortality, in giving greater hope to both man and woman, and greater skill to those whose professions call them to the front when plagues or epidemics invade our country or provinces, our cities or our towns, or sickness clouds the joys of our homes; those, I say, who have made themselves so acquainted, cannot but seriously realize the importance of your mission here and the immeasurable good that is sure to accrue from your interchange of ideas and expressions upon the several matters which you have come here to consider and discuss. Among other things you come here to tell us of domestic hygiene or the art of preserving health, of the best means to be adopted by which that end may be accomplished, and to make that knowledge public so that all who wish may guide themselves accordingly and be partakers of the good that flows from it. Gentlemen, that alone should suffice to have you welcomed to our city in unreserved terms of approbation, in joyful demonstration.

Mr. President, officers, ladies and gentlemen, allow me once more to greet you and to welcome you to Ottawa, the proud Capital of our great Dominion, under whose auspices and in whose care I trust you will enjoy yourselves, and return to your homes with fond recollections of your visit here.

ADDRESS.

By Alderman W. G. BLACK, Ottawa, Canada.

Mr. Chairman, Ladies and Gentlmen—I do not feel, after listening to the eloquent speeches of welcome that you have heard, that I can add anything. But to Dr. Lindsley, as President, and the members of the American Public Health Association, I may remark that being the bearer of an invitation from this city to your last meeting at Philadelphia, it affords me much pleasure to meet you again and to welcome you to our city. The city of Ottawa appreciates very highly the honor of having such a distinguished body of public benefactors in their midst. An Association, such as yours, bonded together for the wise and noble purpose of endeavoring to make the world healthier, and consequently better and happier, will, as it should, always have the hearty co-operation and support of all intelligent persons. (Applause.) An association, which has no selfish or pecuniary interests to serve, is so pleasant an exception, even to our city councils (laughter), that it is an honor for any city to entertain its members. I know the city of Ottawa is not so imposing or as extensive as Philadelphia; but from what I know of its citizens, I am confident the welcome it extends is as warm and enthusiastic as the reception we received last year in that far-famed city of Brotherly Love. (Applause.) I sincerely trust nothing may occur to mar the interest, enthusiasm and profit that characterize your regular annual meetings. And though a little late in the season, later than I strove to have it, I hope the weather may prove fair and favorable, and thus better enable you to enjoy the many interesting points in and around our city. May your brief sojourn in Ottawa be filled with pleasure and interest, and may you carry away many pleasant recollections of your visit to the Capital City of our fair Dominion, of which we are so reasonably proud. (Applause.) I well remember at Philadelphia last year how our good friends, Dr. Lee and Dr. Gihon, treated us; and I might say, that I am delighted to see Dr. Gihon here, because he always acts as a sort of rudder. I remember how these gentlemen, and the other members associated with them, took special care to emphasize the warm and friendly feeling entertained toward Canada and the Canadians. That was a sentiment which we, as Canadians, fully appreciated and reciprocated; and I am sure that the stirring events of the past year have done much to make that feeling even

stronger, and I can conceive of no organization that, within its limits, can do more to bring about those happy sentiments of mutual respect and good-will, than the American Public Health Association, whose members we so heartily welcome to Canada and its Capital to-day. (Loud applause.)

RESPONSE TO THE ADDRESSES OF WELCOME.

By CHARLES A. LINDSLEY, M. D., President.

Dr. John Sweetland, Honorable Sidney Fisher, Sir James Grant, Mayor Bingham, and Alderman Black—In behalf of the members of the Association whom I have the honor to represent, I desire to express to you their thanks for the cordial reception which you have given us. We accept this recognition with the more gratification because we know that it is not due to any personal regard for our members, for like myself, they are mostly strangers in Ottawa, but it is because of the great interest which you feel in the cause in which we are engaged. (Applause.)

When this Association adjourns on Friday next they will go to their separate homes in widely distant parts of this great Continent and resume the various duties in which they are engaged. They were, before this organization was formed, strangers to each other, as we are to you, but they will come together again at the end of another year, for they do it annually, drawn together by a common faith, that there is a science of public sanitation; and they spend the interval of time between these conventions investigating that science, and bring the results to these annual conventions as contributions to it, and for the interchange of thought for the benefit of the good cause. It is emphatically an association of philanthropists. Our sole object is simply to do good to our fellow creatures. We cannot be considered as coming together to cultivate personal popularity, for it is a field that will yield the least profit of that product. We do not come here for pecuniary gains; there is no money in it, and no money to be gotten out of it. We are therefore the more grateful to you for the kindness and hospitality which you have exhibited to us, because we feel we have your sympathy and co-operation in this disinterested but earnest effort to improve the public health. But notwithstanding you have given us such a hearty welcome, I feel, ladies and gentlemen of Ottawa, that we are more profoundly impressed by the personal presence of the educated, refined and cultivated people of your city, who have come here to-night to encourage and cheer us in our work. Ladies and gentlemen of Ottawa, in the name of the Association, I salute you. (Loud applause.)

A SHORT HISTORY OF SEWAGE DISPOSAL AT THE ASYLUM FOR INSANE, LONDON, ONTARIO.

By R. M. BUCKE, M. D., Superintendent.

London Asylum was ready for the reception of inmates in the autumn of 1870, and by the end of that official year 457 patients had been admitted chiefly from the Malden and Orillia branch asylums, which were thereupon closed.

The sewage of the new asylum was thrown into a small creek three miles above the opening of the same into the south branch of the Thames, the said opening being three miles above the city of London. Every summer the creek became nearly or quite dry, and it was not very long before the farmers and others who lived along its course complained bitterly of the nuisance caused by the asylum sewage.

Complaints and threatened prosecution were met by the establishment of a charcoal and gravel filter at the lowest point of the asylum land. The said filter was operated intermittently with more or less (chiefly less) success for some fifteen years. It would do its work fairly well when freshly charged; but it proved impossible, by any reasonable expenditure of labor and charcoal to keep it in a state of continuous efficiency. The protests of the property holders along the creek, which had been partially silenced by the establishment of the filter, broke out anew and were naturally intensified by certain cases of typhoid fever which occurred among them. It became clear that some more radical remedy for the evil would have to be adopted and it was finally decided to adopt that method of sewage disposal which goes by the name of "Intermittent Downward Filtration."

A piece of sandy land, four acres in extent, was selected for the purpose. This, in the first place, was graded perfectly flat, and was then laid out in alternate beds and trenches; the beds being ten feet and the trenches eight feet wide. The difference in level between the surface of the beds and the bottom of the trenches is twenty inches. The length of the beds and trenches is 220 yards. The number of the trenches is eighteen.

The whole plot was provided with an elaborate system of tile drainage, many thousand feet of two-inch tile being used. These were supposed to carry the purified water of the sewage to a well situated at the southwest corner of the field, which well was expected to overflow into a surface drain and its water to run to the head of an adjacent small creek. Experience showed, however, that this tile drainage was

almost or quite unnecessary and useless. Of late years the tiles have been dug up here and there for the purpose of examination and it has been found that no water ever passed into them—they were in precisely the same state as when they were put down—that is, they were apparently quite new and unused. In one part of the field, however, in which the soil is not so sandy, some water does pass into the tile in wet seasons. On the whole, however, water seldom runs into the well and I have no doubt the field would do its work as well without the tile as with it.

The sewage field is on a slightly higher level than that on which the asylum itself stands; it is therefore necessary to use a pump. The sewage from all parts of the institution (including, of course, all laundry and other impure water), is run into an underground tank eighty feet long, forty feet wide and fifteen feet deep. From this tank it is thrown once a day by a centrifugal pump through a six-inch duct into a small well at the northeast angle of the sewage field. This well, after being filled, overflows into a long trough made of three two-inch planks spiked together. Opposite each trench there is a short spout made with similar two-inch planking. Each spout is fitted with a sliding gate and just beyond each spout the trough is fitted with a similar gate. By means of these gates the sewage is turned into any trench desired. The whole arrangement is exceedingly simple, cheap and efficient. The centrifugal steam pump churns up the sewage so that when it comes to the field it resembles dishwater in appearance and is so diluted that it has very little odor.

The population of London Asylum is in round numbers 1000 patients and 200 sane people. The quantity of sewage made in a day averages about 75,000 gallons. It requires two and a half hours each day to throw this on to the field, and within from half an hour to six hours (according to the season of the year and the moisture or dryness of the earth), after it is thrown into the trenches, it has been absorbed by the soil. It is never seen again by us; doubtless it reappears at the surface somewhere as pure spring water. Only two to four trenches are used each day, so that the soil as used is always ready to absorb the sewage. There is no pollution of the soil; it is as sweet to-day as before it was used at all for the purpose in question. The disposal of the sewage then is absolute, as complete indeed as if it had passed out of existence.

But it will be asked, how is it when the ground is soaked with long-continued rain, or when it is frozen hard in very cold weather? Neither of these conditions trouble us. The sewage always disappears in the soil, the process only somewhat checked by previous

soaking and only slightly checked by frost; for the sewage, even in winter, is always many degrees above the freezing point and it thaws the soil sufficiently to make way for itself.

Granted then a sufficiently porous soil, which can be found within moderate distance anywhere, this mode of sewage disposal is simple, certain and cheap. No expensive plant is needed and there are no chemicals or other supplies to purchase to carry it out. But this is not all, these are not its only recommendations.

For the first few years, after adopting this method at London Asylum, we used the field for sewage disposal only; we simply kept it clean of weeds and grass and maintained the level and form of the trenches. But seven or eight years ago the temptation to experiment with the field as a garden took possession of us. All that we did in this direction prospered. We watered the plants grown on the field with the sewage, being careful not to use it at such times as it could taint such a crop as (for instance) strawberries. We found from the first that in the beds between the trenches (although the soil in them was poor) we could grow by aid of the sewage immense crops. For six years now we have cultivated this field to its full capacity with the result that we grow upon it year by year crops of fruit and vegetables to the value of over $200 per acre. So that over and above the disposal of our sewage in a cheap and cleanly manner the sewage itself is so used as to bring us in several hundred dollars a year more than the field in its original condition could possibly (without the sewage) be made to produce.

The crops we have grown upon the sewage field in the last six years have been as follows: Water and musk melons, squash, pumpkins, celery, peppers, cucumbers, tomatoes, peas, radishes, chillies, lettuce, beans, cabbage, beets, carrots, corn, onions, turnips, salsify, sea-kale, asparagus, parsnips, strawberries.

Every one of the crops grown on the sewage field has done well. One of our most successful crops is melons, both musk and water, which we grow there every year. The yield is immense and we have grown better melons on this field than I have ever eaten grown elsewhere. We have had immense crops also of cabbage and celery and the quality of the crops has been much above the average.

I need hardly say that the fruits and vegetables grown on the field are as wholesome as those grown elsewhere. Neither is the health of those who work upon the field in the least affected, there are no healthier people about the institution than they. Why not? The field is simply a beautiful garden which is kept well manured and irrigated.

To sum up: The advantages of this mode of sewage disposal are many and great. It is cheap, simple, cleanly, not liable to get out of

order, wholesome. It would seem to be nature's own plan of refuse riddance. It seems clear that solid excrement, including dead bodies, should be returned to the earth whose chemistry is competent to deal with it and utilize it without itself receiving taint or injury, and not to the waters which have no use for it and which are tainted and grievously injured by it.

REMARKS ON THE DISPOSAL OF REFUSE IN SOME EUROPEAN CITIES.

By THOMAS MACFARLANE, F. R. S. C,, Ottawa, Ontario.

In the summer of 1896 I spent some months on the other side of the Atlantic, visited some of the principal cities in England and Germany and inspected their different systems of refuse disposal. I do not propose, on this occasion, fully to recount my experiences; indeed, even if I were to do so, that would still be very far from exhausting the subject. I desire rather to put on record my impressions regarding these systems and their merits, considered more particularly with reference to the advantage of agriculture.

In order to avoid repetitions, I may, at the outset, state the meanings which I attach to the terms used in this paper, and which are intended to indicate the different sorts of city and town refuse, as well as the various systems in use for their removal. Following the example of W. H. Maxwell (Removal and Disposal of Town Refuse; 1898), I make use of the word "refuse" as a convenient general term for including every description of rejected and ejected matter. It comprehends house refuse, street refuse, trade refuse, factory refuse, etc., besides the liquid refuse which finds its way to the sewers. The term, house refuse, I would restrict to that which cannot, by any possibility, find its way to the sewers. It consists of kitchen refuse, garbage, ashes, cinders, etc. Street refuse is defined in the London Public Health Act of 1891 as "dust, dirt, rubbish, mud, road scrapings, ice, snow and filth," a formidable list to be the result of work described by the one word "scavenging." Excluding the "ice, snow and filth," a convenient word for the remainder might be found in the word "sweepings," which corresponds to the German *kehricht*. Of course, this would also exclude everything capable of finding its way to the sewers. Trade refuse consists of rejected animal and vegetable matter from markets and slaughter houses, while factory refuse might be understood to mean similar substances from cotton, woolen and other mills.

Sewage I take to be the liquid which flows in the sewers and which, in the greater number of instances, consists of human refuse, rain and storm water, wash water, including that from kitchen, baths, laundries, etc., and also all liquids from mills and factories. The latter part of the sewage it would seem to me to be practicable to characterize as

drainage, while the other part, consisting of feces and urine, combined with a certain quantity of flush water, constitute what might be called excretage. Drainage and excretage together make up sewage. Where the separate system of sewerage has been introduced this nomenclature would also find its application. The one set of pipes or sewers would contain the drainage, the other the excretage. In the case of towns where there are systems of water supply and sewerage, but no water closets, as in many German cities, the term drainage might also apply to the contents of the sewers. In many such instances, however, the excretage, or rather the excreta, would come together with the garbage, forming a compound for which there is no other name than manure. Where, in the production of the latter, an absorbent or deodorizer is used, a prefix might be necessary, and we should have earth, ash and moss manure, or compost, as the case might be. In my opinion, it is in the production of the latter that the greatest advantage to agriculture is to be obtained and the public health secured in the most economical manner. I do not mean to say that no other process of utilizing refuse is applicable to the fertilization of the soil, but I am inclined to maintain that in no other way can this be accomplished so economically as by the production of manures and composts.

Maxwell defines the term "conservancy system" as "the name given to the practice of retaining and collecting excreta and waste substances with a view of turning them to account as manure." This would seem to be too wide an application, and I propose to use the term as covering all privy, cesspool and midden systems which serve for the purpose of collecting and applying excreta direct to agriculture. It would then correspond to the "Gruben system" of the Germans. In some English reports the term "interception system" is applied when excreta are "intercepted" or prevented from passing into the sewers. This appears to me to be a convenient term for use when the intercepted matters are worked up by a manufacturing process into a concentrated manure. But it should not be regarded as equivalent to the "pan" or "pail" system, because in the corresponding "Kübel system" of the Germans the contents are not infrequently used without admixture and direct for agricultural purposes. In connection with sewage disposal the words precipitation, irrigation, etc., do not require explanation.

Sewage itself has no value. When fertilizing material of any description has once been allowed to mix with the large excess of water which comes from the clouds, its recovery is economically impossible. This is proved by the fact that where sewage can be conveyed into the ocean or into such large rivers as the St. Lawrence or the

Ottawa, no attempt is made to utilize it. If further proof were wanted that sewage is utterly valueless, the experience of the largest city in the world, London, provides it.

LONDON.

In the month of June, 1896, I visited the sewage works at Crossness on the north and Barking on the south side of the Thames, in company with Mr. W. J. Dibdin, chemist to the London County Council, and Dr. Thudichum, his assistant. At these places, in order to prevent the pollution of the Thames, the London sewage is treated by a precipitation process, the reagents being lime water, not milk of lime, and a saturated solution of copperas. This lime water is first run into the sewage and then the copperas. The proportions used are one part of the crystallized copperas to four or five of burnt lime. The additions increase the volume of the sewage about five per cent. After treatment it is passed through a long canal, dammed up at the far end, and here so-called "sludge" is deposited. This is a black mud which smells somewhat offensively and every chance is afforded it to consolidate and become as free as possible from water. Nevertheless, it contains about ninety per cent. of water when it is pumped into the special steamers which convey it fifty miles out to sea and there discharge it. It has been treated in filter presses and made into cakes containing only fifty-five per cent. of water, but no application or use was found for this product and its manufacture was discontinued. It contained nitrogen equal to one per cent. when stated as ammonia. The "sludge" is to be had gratis by any one who will undertake to use it in sufficient quantity. Seventeen thousand tons of it are produced daily. The present effluent is very slightly turbid and in color appears grayish. Its odor is somewhat disagreeable, although not to be compared with that of the "sludge." It has been experimented with on a filter bed of an acre area, and there is no doubt that its complete purification can be effected by intermittent filtration, if it is judged advisable to incur the cost. At present, however, the effluent escapes into the Thames and the degree of purification, as well as the condition of the river, is regarded as satisfactory. The discharged water is, of course, carried up and down by the tide, but creates no annoyance, and the opponents of this sewage purification system are now said to be satisfied.

The cost of the whole establishment is £120,000 annually for treating two hundred millions of gallons of sewage per diem. This $600,000 per annum is the price which London pays for the luxury of her water-borne system of sewage removal. I have no doubt that it

is the best system that such a city could adopt, and no one at the present time thinks of reducing its cost by attempting the application of the sewage or sewage products to agriculture.

LEYTON.

To the east of London and unconnected with its sewerage system are two municipalities, regarding whose method of sewage disposal I made some inquiries. At Leyton there are precipitation works, in which the precipitants used are twelve grains "sulphurous powder" and eight grains lime per gallon. The sulphurous powder is said to be alkali waste. The sludge produced is put through filter presses, with the addition of three per cent. quicklime. The resulting cakes smell of ammonia and are thrown aside as valueless. To prevent their causing any nuisance, destructors were being created to burn them, as well as the garbage, ashes, etc., which operation has since been successfully carried out.

WALTHAMSTOWE.

At Walthamstowe a precipitation process has been adopted similar to that of Leyton, although a sewage farm had previously been in operation. It was found impossible to apply the crude sewage to irrigation purposes without a previous separation of the sludge. The manager of the Walthamstowe sludge farm said that in order to use crude sewage, there should be one acre of land available to every one hundred of population, whereas, at Walthomstowe there is only one acre to three hundred. According to Gerson & Weyl (Rieeselfelder; Jena; Gustav Fischer; 1896), one hectare of land is necessary for the complete utilization of the sewage nitrogen from eighty persons. Since one ha. is equal to nearly two and one-half acres, it follows that one acre of land to thirty-two inhabitants would not be too much. At Walthamstowe the crude effluent from the precipitation process is led on to the various fields of the farm as required by these. Italian rye grass, mangold wurzel and vetches are the usual crops, but no grain is raised on account of the tendency it would have to "lodge." The fields were formerly under-drained, but on account of the difficulties of filtration, the use of the under-drains was abandoned and arrangements made for working the fields by surface flow. The sewage comes into contact, more or less, with the growing plant, or at least with the rye grass. I took occasion to smell several heaps of it recently cut, and it appeared to be perfectly sweet. It is mostly cut green for the use of cow-keepers, who say that more milk is obtained from it than with dryer fodder.

In spite of all this, so great are the difficulties, both at Leyton and Walthamstowe, that their authorities look forward with satisfaction

to the possibility of their being allowed to send their sewage into the London main sewer. This is the case, also, with the inhabitants on the west side of the River Lee, who would also be glad to have all their sanitary troubles ended in this way. There is no likelihood of the extension of the sewage farm of Walthamstowe, and no anticipation on the part of its authorities of being able to make money by agriculture.

BERLIN.

It was different with the system of sewage irrigation established in the city of Berlin. Its originators certainly anticipated, away back in 1870, that the agricultural operations would yield a profit. In July, 1896, I had the opportunity of attending the exhibition of that year in Berlin and of inspecting the magnificent exhibit made by the corporation authorities of everything connected with the management of the city affairs. Plans showing the limits of the several radial systems of collecting the sewage, photographs of the magnificent pumping machinery at the central stations, specimens of the huge iron pipes through which the sewage is forced up to the necessary level at the farms and a great many more interesting objects than I can mention here, were exhibited, so that it was quite possible to study the whole arrangement without going near the farms. I undertook, however, a visit to one of them, Malchow-Blankenburg, over which I was conducted by one of the intelligent inspectors in charge. The land is mostly let to market gardeners, and the rent includes the use of sewage for irrigation. Some of it is, however, worked by the city, on which grass is often cut four times a season and sold green in Berlin. Grain was also being harvested and looked well, while the vegetable growth was vigorous and healthy. It did not occur to me that there was anything to complain of in the smell of the sewage which was being applied, and from all I could learn, it was not in the slightest degree detrimental to the public health. I conversed with some of the market gardeners, who had nothing to complain of, except the low prices caused by over-production, and competition from Holland. One of them maintained that no money was to be made and that it was all being hoarded by the capitalists. He admitted that he had enough to eat, but no money. This gentleman was smoking a cigar at his work, and the horse and wagon were waiting for the cabbages he was cutting, to take them into the city. My friend, the inspector, told a different story, and said that good market gardeners could make plenty of money on the irrigation fields.

It would, of course, be the height of presumption for any one, paying, like myself, a short visit to Berlin and its irrigation farms, to indulge in criticism, or express any opinions whatever, based upon

his hurried observations. It is a great deal more profitable to pay some attention to the literature of the subject and to learn what the various authorities, who write both for and against the system, have to say about it. After studying their writings as much as my time has permitted, I have reached the following conclusions, which I place before you for what they are worth:

It has been calculated that the amount of nitrogen contained in the sewage used on the irrigation fields every year amounts to one thousand five hundred kilogrammes per hectare, and that the quantity contained in the crops harvested is only, at the most, two hundred kilo. per hectare. Eighty-six and two-thirds per cent. of the nitrogen thus appears to escape unutilized in the water of the drains. Analyses of the latter support the conclusion just stated and show that quantities varying from one-seventh to one-half of the organic substances of the sewage are found in the drain water. The most favorable results seem to be obtained with meadow land, from which the drain water shows an almost complete mineralisation of the organic substances. This does not, however, mean a complete utilization of the nitrogen, but only that that part of it escaping in the drains is in the form of nitrates.

The commission which was appointed by the state to control the irrigation fields stipulated for a surface of at least one hectare for the excreta of two hundred and fifty persons. Even with such a ratio as this, a considerable quantity of inorganic nitrogen, *i. e.*, nitrogen as nitric acid, supposed to be harmless to health, but known to be valuable for agriculture, will still be found in the drain water. In the year 1889 the following areas were used for the purification of the sewage:

At Osdorf, 1 hectare[1] for the excreta of 446 perosns.
At Grossbeeren, 1 hectare for the excreta of 538 persons.
At Falkenberg, 1 hectare for the excreta of 334 persons.
At Malchow, 1 hectare for the excreta of 242 persons.

At most of the farms, therefore, a quantity of sewage far in excess of that anticipated by the Royal Commission was on the fields, such an excess, in fact, as made the utilization of even the organic nitrogen and the purification of the sewage an impossibility.

It has been ascertained that, in order to utilize, by the growth of plants, the nitrogen in sewage from the excreta of eighty persons, an area of one hectare is necessary. That is to say, if we exact that the drain water of an irrigation field shall, just like the drain water of cultivated and manured land, not only be free from organic nitrogen, but also from all except the merest traces of nitrous or nitric acid or ammonia, then one hectare of land will be required for eighty persons.

[1] One hectare is equal to 2.471 acres.

In Berlin one hectare receives the excreta of five times this number, so that the irrigation fields are really troubled with an *embarras de richesse*. In 1896 the population of Berlin was stated at 1,604,303, and the extent of its irrigation farms 4,672 ha. This is equal to three hundred and forty-eight persons to each hectare.

According to the statements made by City Councilor Marggraff at the seventh international hygienic congress in London in August, 1891, with reference to the profits earned on the Berlin irrigation fields, the largest certainly in the world, it appears that they earned about that time two per cent. on their cost, or about one and one-half per cent. less than the rate at which the city can borrow money. This is all they have been able to do, without charging against the agricultural operations any of the cost incurred for pumping the sewage out to the farms. This is certainly not such a result as would induce other cities to imitate the Berlin system. Nevertheless it is not unlikely that such improvements may, in the future, be made in the management of this magnificent undertaking as to place it on a remunerative basis. As regards the direction in which such improvements are likely to take place, I should anticipate the introduction of a separate system of some sort, for keeping the storm water from the excretage, of apparatus for the thorough comminution of the latter, and the acquisition of a still greater amount of land for the complete agricultural utilization of the fertilizing constituents.

BIRMINGHAM.

In 1895 the population of the city of Birmingham was said to be 484,000 and the extent of its sewage farms 496.53 hectare, or 1,227 acres. It has, however, to be remembered that a large amount of the excreta never reaches the sewers, but is collected in "pans" and treated in the so-called interception works. About 215,000 of the population is accommodated in this way, so that the sewage farms have only to take care of the excretage of a population of 269,000, or about five hundred and forty-two persons to the hectare; a number two hundred higher than the Berlin ratio, above mentioned.

The sewage farms of Saltley and Tyburn differ from those of Berlin in so far as the sewage is subjected to a precipitation process before being used for irrigation. I walked over both the precipitation plant and the farms on the sixteenth of June, 1896. At the former the only precipitant used is lime, but it is in the form of milk of lime. Eleven tons of quicklime are said to suffice for the treatment of twenty-two millions of gallons in twenty-four hours.

Six hundred tons of sludge are produced daily, the disposal of which occasions a great deal of labor and trouble. It was at one time

allowed to collect on the fields in large quantity and in the wet condition, but the consequence was a serious nuisance. Now it is spread over the fields at Saltley in a layer eight or ten inches thick, and after it is somewhat dry it is trenched or dug into the land. This means burying it under eighteen inches or two feet of earth, which absorbs the smell. After this the land looks well enough, but it will not bear the weight of a horse. Even some time after the trenching is completed the sowing of rape seed has to be done by men drawing a drill. Usually Italian rye grass is the first crop, then come rape, barley, etc., until the fourth year comes round, when it receives another dose of "sludge." It is stated that the ground will yield good crops, but that it becomes "sick" from receiving too much "sludge." To me it appeared that there was no time to make any use of the fertility of the fields, owing to the necessity of disposing of the product of the precipitation process by continual trenching. In the neighbourhood of Saltley the smell of sewage prevails, and although it cannot be called offensive, it is less agreeable than in the neighborhood of other establishments of a similar character where solution of copperas is used in the treatment as well as lime.

The effluent from the tanks in which the sludge is deposited flows away down to Tyburn, the fields of which farm are well under-drained. Some fields are seen in beautiful bearing condition, while others appear to have just received their dose of sewage. The water escapes from the under-drains into a large brick-lined channel and certainly looks clear enough, but seems to deposit a reddish coating on the sides of the channel. It is still complained of, however, and the talk goes that more land is to be purchased for further purifying it. This final effluent escapes at Castle Bromwich, on the Midland Railway. As regards its composition I have not been able to find such details published as are given in the Berlin reports and which enable one to judge as regards the extent to which the fertilizing constituents of the sewage have been utilized.

I was informed on the spot that the cost to the city after deducting all the receipts for agricultural produce amount to $12,000 annually. According to the accounts for 1896 this loss amounted to over $17,000, altogether independent of interest on the capital expenditure, which amounts to over $400,000.

At the Montague street interception works I observed the manner in which garbage, ashes and excreta are handled. The latter is collected by the pan system, which was introduced in 1874, gradually replacing the twenty thousand cesspools then existing. The pans, which are made of galvanized iron, are cylindrical in shape, eighteen

inches in diameter and fifteen inches deep, and covered with a tightly fitting lid. The vans used carry eighteen pans and have a receptacle at the tail end into which the ash tub refuse is tipped. The garbage, ashes and breeze (or half-burnt coal) is riddled on octagonal rotating screens, which separate the fine ashes from the rougher material. The latter is further sorted by removing from it broken crockery, brick ends, tin cans, etc. What remains is in such a condition as to furnish fuel for raising all the steam which is required in the works, and might produce considerably more. The ashes or clinkers produced from the destruction of the garbage and coarse ashes, etc., are used for even more useful purposes than filling up low ground. They are applied in making concrete and are also ground, mixed with lime and water, and sold as ready made mortar. The steam from the boilers above the destructor furnaces is used for driving the engine, mills and other machinery, the latter being chiefly employed for the treatment of the excreta or night soil. As regards the latter, on reaching the works, the contents of the pans are emptied into tanks, where they receive an addition of about one per cent. oil of vitriol. Here the more solid portion settles, and is drawn off into a machine, where it is mixed with fine ashes from the rotating screens above mentioned. This forms an ash manure, which is taken out into the country and sold at varying prices, or given away to the farmers.

The more fluid part of the excreta is used for manufacturing a species of poudrette. Both steam and hot furnace gases are used for this purpose, the latter being preferred as cheaper and better. The evaporating apparatus consists of a revolving cylinder, charged with the liquid and through which the hot gases from the furnace pass direct. There are no stirrers inside, and the product is not discharged until it is semi-solid. It is then broken up into small pieces and completely dried. Its analysis shows:

	PER CENT.
Nitrogen stated as ammonia	7.49
Phosphoric acid total	3.23
Potash	2.97

This would have a value here of $24.38[1] per ton, and is said to sell in Birmingham at $6. Of course, it may be said that it costs more to produce it than it sells for, but this can also be said of the agricultural products of a sewage farm.

[1] Values of Fertilizing Constituents in Canada:

Nitrogen as Ammonia and Nitric Acid	13c	per lb.
Organic Nitrogen	12c	"
Phosphoric Acid, Soluble	6c	"
" Reverted	5½c	"
" Insoluble	5c	"
Potash	5¼c	"

The processes of refuse disposal adopted by the corporation of Birmingham are, to a large extent, the same as practiced in the other English towns which I visited. Therefore, instead of describing all that I saw at these places, I shall only point out variations from the Birmingham practice, besides mentioning particulars of importance which are peculiar to the localities visited.

MANCHESTER.

Manchester possesses precipitation works at Davyhulme, but no sewage farm. The excreta is "intercepted" to such an extent that only one-fourth reaches the sewers. A "storm overflow" is to be observed in the sewage canal in the yard of the works, but it is said that it is seldom that anything escapes there. The precipitants used are lime water, milk of lime and solution sulphate of iron, and after their introduction the whole mixture is agitated by waste compressed air. The sludge produced is mixed with slaked lime and then pumped through filter presses. Solid cakes are thus obtained, which is not possible without the slaked lime. On the other hand, a considerable amount of ammonia is liberated and passes into the water from the presses, which smells of it strongly. The cakes produced are valueless and are dumped over the "tip," where farmers are at liberty to remove them, and frequently do so. There is no doubt that they are capable of making excellent soil.

Eighty-six million gallons of sewage are treated every week, which quantity receives fifty-eight tons of slaked lime, containing forty per cent. water, and also fifty tons copperas. The wet sludge amounts to 93,448 cubic feet of sixty-five pounds each. To effect the pressing of this quantity sixty-six tons of slaked lime are used, and the product amounts to nine hundred and thirteen tons of pressed cake.

The effluent from the precipitating tanks is clear, slightly yellowish tinted and has no smell nor any very disagreeable taste, but it is not up to the standard of purity for being discharged into the river courses. Nevertheless, the most of it is so discharged, and only four millions out of thirteen million gallons daily are treated by a process of land filtration. It is allowed to flow on to fields which are well underdrained and which yield nothing agriculturally. There is about six feet depth of a loamy sand, or, in places, of loamy clay, and the final effluent which flows from the under-drains is quite clear, colorless, odorless and almost tasteless.

As regards the quantity of material used in the precipitation works for causing the "sludge" to subside, a comparison may here be made of the figures given me at Barking and Crossness (London), Saltley (Birmingham) and Davyhulme (Manchester). At the first-named

place four grammes of lime, or sixty-two grains, are said to be used to the gallon of sewage, which is equal to about four tons per million gallons. At Saltley only one-half a ton of lime is used to a million gallons of sewage. At Davyhulme the quantity stated is seven grains per gallon, which corresponds to one thousand pounds per million, or 0.45 tons. The quantity of copperas used at the London sewage works is about one ton per million gallons; at Manchester it is 0.58 tons.

Manchester has, like Birmingham, a "pan" or "pail" collecting system for huge quantities of excreta, which system, about ten years ago, replaced, not only the open cesspools, but also the ash-closet system, which used to be described as peculiar to Manchester and Rochdale. The latter system, which was thought to have many advantages, was abandoned because, as a general rule, the sifting of the ashes was not properly attended to by the inhabitants, and frequent cases of nuisance was the result. The present system resembles that of Birmingham so much that I need not take time to detail the unessential differences. The products are much of the same character, but in manufacturing the poudrette an addition is made of bone dust, in order to increase the percentage of phosphoric acid. The "Manchester corporation concentrated manure" is guaranteed to contain four per cent ammonia, ten per cent. phosphates, five phosphoric acid and one per cent. potash. This, at the rates for valuing fertilizers in use in Canada, would be worth $20.65 per twenty-two hundred pounds. In Manchester this quantity sells for £3, or $15. It has not been found possible to dispose of all the "ash manure" produced at the works of the corporation, and a great deal of it is utilized on the corporation estate at Carrington Moss. This property, comprising one thousand one hundred acres, and Chat Moss, with two thousand six hundred acres, both situated about ten miles from the city, close to the ship canal, have been acquired for the express purpose of receiving this and other refuse of the city. Such material as clinkers from the Water street and Holttown stations, street sweepings, which consist largely of horse manure, and market garbage are conveyed direct to these estates and utilized. I shall have something to say later on, as regards the great value of these properties for the purposes of the corporation.

OLDHAM.

At the Oldham destructor works the furnaces used are made by the Horsefall Company, of Leeds, and are said to offer many advantages. The material destroyed in them consists not only of "dry refuse," but also of household ashes, which are not even sifted. As a substitute

for the fine ashes in the night-soil works, cotton shoddy and other refuse from the mills of the place, is used. Of this two-thirds are used with one-third excreta to make manure, for which the farmers pay two shilling six pence per ton besides the cartage. The Oldham authorities propose to supplant the pail system by a water-borne system of sewage and precipitation works. The latter are not yet completed, although it is said that $300,000 have already been expended on them.

ROCHDALE.

The pail system was originated in Rochdale about the year 1870, and so was subsequently the manufacture of ash manure from excreta. In 1882 a new method of treatment was adopted for converting the whole of the excreta into poudrette, and since then no ash manure has been produced. Thus the fine ashes can be sent at once to the "tips" or "dumps." The poudrette or manure is said to contain eight and one-half per cent ammonia, eight and one-half per cent. tribasic phosphate of lime and five per cent, sulphate of potash. The offensive gases produced from the evaporation of the excreta are carried through what is called a "cremator," a brick chamber heated by gas coke, and thus everything in the shape of a nuisance is prevented.

While visiting Manchester and Oldham I had become aware that a certain degree of rivalry exists betwixt the pail system of collecting excreta, by which it is "intercepted," and the water-closet system, by which it finds its way to the sewers. Each has its adherents and the contention between them is sometimes sharp enough. In Rochdale, at the time of my visit, the pail system had the upper hand, and a population of 72,000 is served by it. There are only about six hundred and fifty water-closets in Rochdale, corresponding to a populaiton of three thousand. Besides this small amount of excreta, there are large quantities of domestic drainage and liquid manufacturing refuse, for the purification of which precipitation works and an irrigation farm are being constructed and laid out. Leaving out of consideration the expenditure connected with these new works, but including everything else connected with the collection and treatment of the refuse of the town of Rochdale, it may be said that, since the introduction of the poudrette manufacture, the gross receipts have amounted to one-third of the gross-expenditure.

GLASGOW.

The condition of the Clyde, which passes through the city of Glasgow, has long been instanced as an example of inexcusable river pollution. The dark, almost inky color of its water is, I believe, chiefly owing to the large amount of liquid manufacturing refuse produced

in chemical and copper-extracting works. Of course, there is an immense quantity of excretage, as well, in the sewage, but it is not alone to blame for the dirty condition of the River Clyde.

A beginning has been made at introducing a better state of things by the construction of the "Eastern District sewage purification works," at Dalmarnock, where about one-fourth of the water-borne refuse of Glasgow is treated. The processes employed resemble those of Davyhulme (Manchester), but sulphate of alumina is used instead of copperas, as a precipitant.

HAWICK.

In Hawick (population 22,000), a water-borne system of sewerage prevails and is, in fact, compulsory. When its enforcement began, the water supply was found to be insufficient and more had to be obtained. The original drainage of Hawick was on the surface, and that being uneven and hilly, storm-water was readily got rid of. It is still led off on the surface and very little of it finds its way to the sewers. Here we have a modification of the separate system, or at least a case in which the contents of the sewers consist of excretage only, the treatment of which is not interfered with or rendered abortive by large and sudden inflows of storm-water. Previous to any precipitation it is allowed to deposit, mechanically, some of its impurities by passing through two pretty large basins. The effluent from these, as it passes on, receives six to ten grains of ferrous sulphate and ten grains of quicklime to the gallon. This treatment has taken the place of one in which sulphate of alumina and a much larger quantity of lime were used. The resulting sludge deposits itself in some half dozen precipitation basins and the effluent from it is comparatively clear and has an alkaline reaction. It then flows through a series of ponds, where more deposition takes place. It is not further filtered or aerated and finds its way through an iron pipe fifteen inches in diameter into the River Teviot. It would seem that this effluent must be unusually rich in fertilizing substances, but I was not able to ascertain that any analysis had been made of it. The mechanical deposit, and the sludge from the precipitation basins and the ponds, all find their way into manure heaps, which are made up of these and the sweepings and garbage of the town, including ashes and other domestic and slaughter house refuse. This manure is sold at six pence per ton, delivered on the cars. To the farmers it is delivered at the rate of five pence per ton per mile, no charge being made for the manure itself. Two million gallons of excretage are thus treated daily at a cost of £1,500 annually.

In Dr. J. H. Vogel's "Utilization of City Refuse" (Verwerthung der Städtischen Abfallstoffe), published in 1896, particulars are given regarding the systems of refuse disposal practiced in five hundred and sixty-four German towns and cities, having a population from five thousand upwards. Of these ninety-two per cent. are still contented with the so-called Gruben system (conservancy system in England) for the collection of excretage, for the very good reason that it enables the authorities to prohibit human refuse from gaining access to the sewers. In 1896 I had an opportunity of observing the working of this system in Freiberg, a town of 30,000 inhabitants, and Leipzig, with a population of 400,000.

LEIPZIG.

In the latter city about one-tenth of the population make use of water closets, and the remaining nine-tenths of the ordinary "aborts," or privies, which are connected with the pits by glazed sanitary pipes seven to eight inches in diameter. The pits are usually placed in the court yards, are well built of stone or brick and have in the center of their floors a depression in which the end of the suction pipe from the receptacle wagons may be placed. A vacuum is created in the receptacle by an air pump placed on another wagon and driven by steam, and the contents of the pit are thus drawn up into the air-tight receivers. Any offensive gases drawn off by the pump are passed under the grate of the steam boiler and so destroyed. The system is the same as that in use in Dresden, Chemnitz, Stuttgart, Mannheim, Nüremberg and other German cities. The receptacles above mentioned are emptied into similar containers placed on railway wagons, by means of compressed air, produced by the same air pump and steam boiler used in emptying the pits. The railway wagons are then taken out to stations four or five miles distant from the city and there emptied by flow into lower-lying reservoirs of large dimensions. This is done to store it until required by the farmers, who pay for it at the rate of 2.20 marks per cubic meter, and cart it away themselves from the reservoirs. When delivered on the farms the price is three marks per cubic meter. When the stock accumulates it is often given away gratis. The mixed fecal matters are applied by the farmers at once in the fields. With reference to the water-closets, the excreta from them is not allowed direct access to the sewers. It is received into a pit and disinfected by the use of chloride of lime and other chemicals. From the first pit there is an overflow into a second, where further treatment takes place, as well as precipitation. The effluent here is under the inspection of a city official, who is supposed to test it in some way or other. The disinfecting is done by

the householder or by persons in his employment, and none of the expense of it is borne by the city or by the contractors who remove the refuse. The latter remove the substances deposited in these disinfection pits in the same manner as from those of the ordinary construction, but double rates are charged for the service. Strangers in Leipzig boarding at private houses sometimes complain of the smell from the water-closets, but the foreman in charge of the work of removing the refuse maintained that such cases were extremely rare.

FREIBERG.

In the town of Freiberg, Saxony, the sanitary arrangements are essentially the same as those of Leipzig, but on a smaller scale. There are a few water-closets but at least nineteen-twentieths of the population are served by the system of direct removal. The machines used for emptying the pits are worked by hand, and the escaping gases are passed through a charcoal fire in a small iron stove, attached to the pump, in order to accomplish their deodorization. Some of the excreta pits are very badly placed. One, which I saw being emptied in the old part of the town, was situated under the staircase of a tenement house. There was no smell developed, although the contents were constantly stirred to insure the effective working of the suction pipe. The receptacles on the wagons in which the pit contents are transported are constructed of wood, not iron. When loaded they are driven out of the town to a reservoir about two miles distant, which is built of brick, divided into two halves. These are covered with a wooden roof upon which a wooden ventilation shaft is erected with a height of about eighty feet. There is not much odor perceptible around the reservoir, nor does the discharge of a receptacle or the filling of the farmers' wagons occasion any difficulty. Upon the latter are placed wooden cylinders about 12 feet long and 2½ in diameter in a horizontal position. The excreta is pumped up out of the reservoir by a chain pump into a square stationary receiver, containing a cubic metre, for which the farmers are charged M. 1.50. So far there has been no difficulty in selling the product of the town at this rate.

BREMEN.

In Bremen, a city of 125,000 inhabitants, there exists what Dr. Vogel calls a mixed system of refuse disposal. Human refuse is excluded from the sewers, and about one-third of the inhabitants are served by the pit system above referred to. A peculiarity connected with it is the use of pneumatic receptacles for emptying the pits. These are placed on wagons, are made of iron and look like small

round boilers with a manhole in one end. These, when brought about ten miles out of the city, full, are discharged by simple gravitation into a reservoir, from which the farmers of the neighborhood are supplied. The boilers or receptacles when empty have a jet of steam thrown into them which drives out the air, and takes its place. Then the receptacles are securely closed. On their way back to the city they cool, the steam condenses, and a vacuum is formed. On arriving at the pit which is to be emptied the suction pipes which extend to the bottom of it are joined to the hose of the receptacle and the valve of the latter opened, when it is filled from the pit in about three minutes. Of course, it sometimes happens that there are obstructions, and occasionally the contents of the pit are not sufficient to fill the receptacle, but on the whole the system works well and dispenses with the engine or pumps used in Leipzig and elsewhere.

Another large portion of the excretage of this city is removed by a well-conducted pail system, and about 55 per cent. of the population is served in this way. A third system is also at work which consists in the use of moss litter as a deodorizer, absorbent and disinfectant. I inspected the working of this plan at the gas works where there are about 200 men employed, who use the closets at least during one shift. The receptacles, which looked like small casks, are placed under the seats, and are removed and emptied twice a week whether full or not. Every morning it is the duty of a workman to go to each closet and strew moss litter on the contents of the receptacles. All offensive odors are absorbed by it, and nothing disagreeable is to be observed in inspecting the closets. Four bales of moss litter are used per annum, averaging each 140 kilos, or about 1408 pounds in all. This is equal to seven pounds per annum per man on a twelve hours' shift. For twenty-four hours the yearly quantity required would be fourteen pounds per man. This is a very small quantity and shows that moss litter is far more effective as a deodorizer than dry earth, Moss litter is used extensively in private houses and automatic closets have been constructed to effect its proper admixture with the excreta. I inspected two of these at the Tivoli Theatre and the Hansa restaurant. In one case the self-working apparatus was out of order and in the other the box for containing the moss litter was empty. Under such circumstances the question arises as to whether the moss litter system would not work better without automatically constructed seats and special receptacles. There would seem to be no obstacle in carrying it out with the ordinary seats and well constructed pits in which the resulting dung might be allowed to accumulate for, say, six months before emptying. In towns irregularities might be prevented by specially detailing men to strew the moss litter. Whatever the

merits of this new system may be, there is no doubt that the use of moss litter as a deodorizer is increasing in Bremen, while other German towns such as Neumünster, Münden and Crossen a. O., have adopted the moss litter system exclusively, Münden going so far as to make its adoption compulsory.

BRAUNSCHWEIG.

On the other hand it has to be admitted that in Braunschweig, where the moss litter system was first introduced, the authorities have seen fit to resort to other means of refuse disposal. The population now exceeds 100,000, and the building of new houses with modern conveniences has caused the pollution of the sewers with excretage, which finds its way into the river Oker. To prevent any further contamination arrangements are being made for the treatment of the sewage by irrigation as in Berlin. I was informed, however, that for about one-half the population of Braunschweig the moss litter system is still praticed and that it works well. The resulting moss manure is not in the slightest degree offensive and has been proved to have a high agricultural value. Very thorough investigations have been made by such German scientists as Gärtner, Fränkel and Stutzer regarding the power which moss litter possesses of destroying bacteria. It has been found that when it is moistened with about 2 per cent. of sulphuric acid in a dilute condition it is capable of destroying every species of disease-breeding germs, and that its use is in the highest degree advantageous from a hygienic point of view. It is therefore not only an absorbent and deodorizer, but also a disinfectant. It contains from 0.75 to 1.75 per cent. of nitrogen in an inactive condition, but this becomes available after its return to the soil in the shape of moss manure. Its value in nitrogen alone is equal to $3 per ton.

Moss litter is produced in large quantity in North Germany and Holland, and is shipped from Rotterdam to London and even to Boston and New York for use in stables as bedding and as an absorbent. There are extensive bogs in Canada from which it can be produced, and the sample now before the meeting is from one now being worked in the County of Welland. Experiments have been made with it which show that 100 pounds are capable of deodorizing 800 pounds of excreta. Compared with dry earth its deodorizing power is at least eight times greater. It is equally effective with kitchen refuse, which in summer is a source of much annoyance to housekeepers. When this refuse is collected in a tub, and strewed over with a small quantity of moss litter all offensive odor disappears. Layer after layer may be thus treated and, when the tub is full, the contents can be easily burnt in a kitchen stove.

In these "remarks" I have pointed out the distinguishing features of the refuse disposal systems in fourteen cities and towns in England and Germany, as they appeared to me at the time of my visit. If we attempt to classify the systems described, as far as regards sewage disposal, we at once become aware of their exceeding diversity. In certain of the towns described, not far distant from each other, the systems are essentially the same. This is the case with London and Leyton, with Rochdale and Oldham, with Freiberg and Leipzig. But in all the others the systems are distinctly different as the following list shows:

London—Water carriage and precipitation.

Leyton—Water carriage and precipitation.

Berlin—Water carriage and irrigation.

Walthamstowe—Water carriage, precipitation and irrigation.

Birmingham—Conservancy by pail system, interception, water carriage, precipitation and irrigation.

Manchester—Conservancy by pail system, water carriage and precipitation.

Rochdale—Interception by pail system.

Oldham—Interception by pail system.

Glasgow—Water carriage, conservancy and precipitation.

Hawick—Deposition and precipitation.

Leipzig—Conservancy by pit system.

Freiberg—Conservancy by pit system.

Bremen—Conservancy by pit and pail systems, and moss litter system.

Braunschweig—Water carriage, irrigation, and moss litter sytem.

In these fourteen cities and towns it would therefore appear that ten different systems are in operation essentially differing from each other.

In the work above mentioned Dr. Vogel states that there is no one method for the disposal of town refuse which can be considered as the best and suitable for all circumstances and localities. Something to the same effect has been stated more than once in the reports of the Board of Health for the Province of Ontario. There is no universal medicine, and no system everywhere applicable with equal economy to the cleansing of a city. But it will readily be admitted that there are many methods in operation at the present day which leave much to be desired in æsthetic, hygienic and economic respects, and some of these imperfect methods have been described in this paper. If any of these are objectionable, then improvement is desirable, and it is for us to endeavor to ascertain the direction in which such improvement is most likely to be found. Each one of us has no doubt his convictions and perhaps prejudices on the subject. I confess that I have mine, based

largely, I claim, upon observations made in the localities above mentioned. With all due deference to the opinions of other members of this Association who have studied the subject, I shall state my views for what they are worth.

For cities I believe the direction of improvement lies in the exclusion from the sewers of storm and surface water, and the treatment of the excretage by comminution or precipitation and irrigation. It is very well known that in many precipitation works and also on irrigation farms the regular course of work is frequently interrupted and the proper utilization of the sewage prevented by sudden or long continued rains. By these the sewage is diluted, or carried away into the water courses sometimes without any treatment at all, complaints and suits for damages being the result. In the case of Hawick we have seen that it is possible to exclude surface and storm-water from the excretage in the sewers, and in all similar hilly localities, such as Birmingham for instance, it would seem comparatively easy to provide surface courses for the surface water. Where this is impossible there seems to be no other plan available, except the separate system, the drainage going direct to the water courses, and the excretage to the precipitation works and irrigation farms.

For towns of 30,000 population and under, I believe that improvement will be found possible by substituting the moss litter system for conservancy of every description. The reason why systems of direct disposal are so difficult to abolish lies in the fact that the introduction of any of the various systems which have been proposed in their place involves financial sacrifices which many communities cannot be persuaded to make. On the other hand to convert a conservancy into a moss litter system would seem to be a comparatively inexpensive undertaking. Much alteration would not be required in the existing conveniences, and the immediate result would be the production of an inoffensive manure, scarcely recognizable as such, which could be handled and transported without annoying anyone, and which would be welcome to the farmer as an excellent fertilizer. In order, however, to insure the successful working of the moss litter system it is before all things necessary that the town authorities should manage it and that a method of regular inspection should be carried out, so as to insure the proper and regular use of the moss litter. It is not to be expected that such a system would replace that of water carriage where it has been established, but there are many small towns where such a simple and effective plan of excreta disposal as that by means of moss litter could readily be established, and would be retained permanently even after the population had considerably augmented.

I may mention that the treatment of excreta by moss litter has long been in use at Caledonia Springs, Ont., and has given the most satisfactory results. I give this as an excellent practical example of the system which I look upon as the most effective and economical for towns and villages. With reference to the plan which seems to me ought to be recommended for cities, namely, exclusion of surface water, comminution and irrigation, our best example in Canada is that practiced at the Asylum for the Insane at London, Ont.

I cannot conclude this paper without again noticing Manchester and its peculiar troubles and surroundings. It appears that since the time of my visit the effluent flow from the sewage works at Davyhulme has not been giving satisfaction, and a scheme was proposed for conveying it to the estuary of the Mersey by means of a culvert. Subsequently this plan encountered violent opposition and had to be abandoned. The corporation of Manchester must by this time have almost arrived at the conclusion that to solve the sewage problem "passes the wit of man." At the same time it is the fact that the city owns 3700 acres of lands on the banks of the ship canal, underlying which there is a practically inexhaustible quantity of moss litter. By removing this, and utilizing it in the city for the manufacture of moss manure, an excellent dumping ground might be obtained for the less offensive refuse of the city, such as ashes, rubbish, etc. Upon this in course of time, and by means of the moss manure, the whole extent of both Chat and Carrington Moss might be converted into a most fruitful area, and made in fact to "blossom like the rose."

ON THE MOST RECENT METHODS OF SEWAGE DISPOSAL NOW IN OPERATION IN THE UNITED STATES, BEING, TO SOME EXTENT, THE OUTCOME OF EXPERIMENTS MADE BY THE MASSACHUSETTS STATE BOARD OF HEALTH, WITH REMARKS UPON THEIR ADAPTABILITY (IN WHOLE OR IN PART) TO CITIES IN CANADA.

By CHARLES G. HORETZKY, C. E.,

of the Ontario Public Works Department, Toronto.

Gentlemen of the American Public Health Association—In December, 1895, I was one of the consulting engineers with reference to the disposal of the sewage of the city of London, Ontario, and then recommended a system of land disposal or filtration; my recommendation being largely based upon the successful working of the Brockton, Mass., plant then in operation, and upon the very doubtful success of several chemical systems visited upon a tour of inspection through the United States in October of that year.

Since 1893 further, and most important discoveries in this direction have been made by the Massachusetts State Board of Health at their Experimental Station at Lawrence, Mass., where the last few years have been devoted to researches upon the capabilities of gravel and coke filters aided by forced aeration. A description of these experiments would be interesting, but out of place here, and can be seen in the different annual reports. It will suffice to say that the conclusions arrived at offer a great incentive to the practical ingenuity of all those interested in the construction and maintenance of sewage disposal plants.

It has been demonstrated that filters of gravel of an effective size of 5.40 mm. can produce a most satisfactory effluent, and remove from 60 to 85 per cent. of the organic matter of strong city sewage, at the rate of 400,000 gallons daily per acre.[1]

Coke breeze (screenings from commercial coke), has also been found of immense value as a filtering and straining medium, and possesses the advantage of being fully as valuable for purposes of combustion after its use as a sewage strainer and sludge retainer, as before. This will be discussed further on.

[1] (Note: In a sample of sand or gravel, the effective size is the maximum diameter in millimeters of the finer ten per cent. of the sand grains, or gravel.)

As regards the forced aeration applied to these experimental filters, pipes were passed through, and within six inches of the bottom. A fan blower driven by electricity was attached, and, while the fan made 3600 revolutions per minute, an air current capable of sustaining three inches of mercury was forced through the filters. By frictional loss the force of the current was reduced fully one-third.

In the experiments with the coke filters up to January 1, 1895, the average rate of filtration was 260,000 gallons per acre daily for six days in the week, while the average removal of organic matter (albuminoid ammonia) and bacteria was 95 to 98 per cent. respectively.

In 1894, Col. Waring instituted experiments upon sewage purification aided by forced aeration, at Newport, R. I. These were continued during five months from May till October, and the results set forth in a pamphlet which also contains a synopsis of the chemical work and investigation carried out simultaneously by Mr. Geo. W. Ralfe, A. M. (Harvard).

The Willow Grove Park (15 miles from Philadelphia) Sewage Disposal Plant was constructed by Col. Waring upon the principles evolved by the Newport experiments. It is simply composed of a set of "strainer" and "aerator" beds one-eighth acre in extent in all. The sewage applied daily is assumed to be from 60,000 to 100,000 gallons.

The resulting effluent at date of my visit on the 6th of September was very good, clean, and odorless, and the most of it was in daily use for sprinkling the lawns and roadways at Willow Grove.

I found, however, that the receiving well was clogged with hard compact sewage to the depth of four feet. This will have to be removed eventually by hand, as it cannot be pumped up.

The man in charge informed me that the plant had been one year in operation, and that the "strainer" beds have to be overhauled every season (every six months), and the material washed and returned to its place. This, he says, occupies three men during a week.

As to the conclusions arrived at by the chemist in charge during Col. Waring's Newport experiments, they indicate that a "strainer" tank can remove 40 per cent. of the nitrogenous matter in ordinary sewage, if this sewage, roughly strained and free from mud, is applied continuously, at a minimum rate of 3,000,000 gallons daily per acre; and that an "aerator" bed one acre in extent, with nitrification properly established, and proper manipulation, will remove 95 per cent. of the organic nitrogen of a "strainer" effluent, applied at a rate of at least 800,000 gallons daily. It will do so for an indefinite period,

under, of course, proper conditions of working. This means that one-fourth acre of strainers, and one acre of aerators (one and one-fourth acre in all), will suffice for the treatment of the sewage of 10,000 people at the rate of 80 gallons per capita.

I have been unable to obtain the cost of the Willow Grove plant, now about one year in operation, which includes the pump house, pump, blower, masonry and concrete work, filtering material, and all accessories; hence, it is difficult, nay impossible, to compare it in the large and practical way with other methods which will be discussed further on; but, from my own actual observation, and the statements of the man in charge, I am of the opinion that the conclusions reached by the experimenters are quite in accordance with the actual workings of this very valuable system of "Artificially Aerated Bacterial Filters," as claimed by the inventor.

I now beg to direct attention to the colored sectional drawing on the wall, which illustrates the actual working of Col. Waring's method.

Reverting to the Massachusetts State Board of Health experiments with coke, I now quote an extract from page 480, Report 1896, which sums up the immense value of this material as an aid to sewage purification, and especially as a sludge retainer:

"When coke breeze can be obtained, and the sewage given a preliminary treatment before sand filtration, by being passed through this breeze at a high rate in gallons daily per acre, the organic matters can be removed from the entire body of the sewage as completely as chemical precipitation removes them from the main body of the sewage.

"There is no resulting sludge liquor from this coke straining process, and the clogged coke can be removed from time to time and burned, the sludge being, of course, held by, and burned with, it.

"During some of the experiments, 13.8 cubic yards of coke per million gallons of sewage filtered, were removed, dried, and could have been used as ordinary fuel.

"By straining through coke we have removed during 1895, 54 per cent. of the sludge (albuminoid ammonia) of the sewage.

"The latter has been strained at an average rate of one million gallons per acre daily, and the coke strainer contained from six to eight inches in depth of coke. The coke is known as breeze (screenings from ordinary coke).

"At the Lawrence Gas Works, where it is obtained, it is used under the boilers, and estimated to be worth one-fourth as much as the

steam coal, or, from $1 to $1.25 per ton; the amount used has been 10 cubic yards per million gallons of sewage strained, and, as a ton of coke occupies about 2.3 cubic yards, the sewage has been purified, to the extent given, at a cost for coke of $5.43 per million gallons of sewage strained, estimating the coke to be worth $1.25 per ton.

"By this method we remove the sludge from the entire body of liquid, and get rid of the concentrated sludge liquor which results from sedimentation, or any chemical precipitation process, and, it seems that the coke is as valuable for combustion after use in the strainer, as before."

I may add that in the coke filter experiments of 1895, the removal of organic matter and bacteria, at a rate of 260,000 gallons per acre daily, for six days in the week, was 95 and 98 per cent. respectively.

Now, sludge resulting from sedimentation or chemical precipitation contains 90 per cent. of water, the latter being separated from the solids by a most expensive and dirty method of pressing. Even then, the resulting cake contains 50 per cent. of water, and, using the lime and alum precipitation process (probably the best), the pressed sludge will amount to eight tons per million gallons treated, equal to 40 tons as swept from the tanks. As one-half of the pressed cake consists of water, the dry solids are equal to four tons per million gallons of sewage.

In the Lawrence experiments above quoted, the sludge was removed by burning at a cost of $5.43 for coke per million gallons treated, while, in any chemical process, eight tons of semi-fluid, evil-smelling cake are produced at a heavy expense for filter presses, cloth and labor, and afterwards the problem of getting rid of this foul asset has to be faced, since it is utterly futile to think of selling this cake to farmers, and the further expense of carting it away must undoubtedly be taken into consideration. In England the cost of producing sludge cake may be taken, at the majority of works (according to Santo Crimp), at 2-6 sterling per ton: and the same authority states that, although it is sometimes sold for a trifle, or taken away by farmers, the latter are as often paid to remove it. In the vicinity of large cities it has been dug into the ground, or spread out to dry, but however handled or disposed of, it is an undoubted nuisance; hence, any method of sewage disposal whereby the sludge difficulty can be eliminated entirely, must recommend itself to practical men.

In estimating the cost of sludge removed (per million gallons of sewage treated) by coke strainers, as against sludge pressing into cake, we have roughly, taking the Lawrence prices of materials used,

BY COKE STRAINERS,

Say 4½ tons of coke @ $1.25	$5 62

BY SLUDGE PRESSING.

Pressing 8 tons sludge cake @ 60 cents	$4 80
Carting away 8 tons sludge cake @ 60 cents	4 80
1000 lbs. crude alum @ $25 per ton	12 50
1000 lbs. slaked lime @ $9 per ton	4 50
Required for precipitation of one million gallons of sewage	$21 80

Therefore, there is much to be said in favor of coke as a strainer, as compared with any "precipitation" process; while the cost of buildings, tanks, and the other accessories required in the last named process, will certainly counterbalance that of a furnace, drying ovens and chimney necessary for clogged coke combustion.

The Pennsylvania Sanitation Company of Philadelphia have taken advantage of the foregoing facts as regards the valuable properties of coke breeze and aerated sand and gravel filters, in their sewage disposal plant erected at Reading, Pa., which has been in very successful operation for the last year and a half.

The population of Reading is about 80,000, as I am informed, but so far, only about 25,000 people contribute to the sewerage system.

The average daily flow of sewage treated by the Philadelphia Sanitation Co.'s works during August last was 1,586,463 gallons.

These works comprise a very handsome pumping station situated at Sixth and Canal streets. This station includes two large receiving reservoirs in which the coke strainers are placed, two large pumps of 5,000,000 gallons capacity each, three 65 H. P. boilers, drying ovens and tall chimney stack, which ventilates the receiving chambers.

A force main 7200 feet in length conducts the strained sewage along the banks of the Schuylkill River to the filter beds. These filter beds comprise an area of 25,000 square feet, or fifty-seven hundredths of an acre. One-half of this area is supported by an iron structure, and is at a level eight feet six inches higher than the lower half. The upper beds are divided up into ten compartments, each 25 feet by 50 feet. Iron pipes resting upon beams and girders, supported by iron

(NOTE: The drawings upon the wall and the photographic views now exhibited, explain very clearly the system of the Pennsylvania Sanitation Company as constructed at Reading.

These works have been extremely well designed, and appear to me to be an excellent practical illustration of the Massachusetts experiments with coke and "forced aeration."

The filtration area is rather circumscribed—a defect easily remedied.

Too much credit cannot be accorded the designer and engineer—Mr. John Jerome Deery of Philadelphia.)

columns, carry the filtering materials which consist of three different layers of broken stone and rather fine sand; the whole being two feet in depth. The surface of the filters is protected from wind, and the erosive action of the falling sewage by a slatted floor, removable for cleaning purposes.

There is usually one foot head of water on the upper filters while in operation. The open gridiron-like bottom affords access to the outside air, and is, in fact a modification of the "forced aeration" experiments of the Massachusetts State Board; further aeration is obtained by the eight feet six inches rain-like drop of the effluent to the surface of the second filter which is of coarser material, and about three feet in depth, and is aerated throughout by pipes and gutters. The effluent from the last filter emerges as a clean, bright fluid, quite sufficiently purified to enter any large stream or river, and certainly of a better quality than that of the Schuylkill, into which it finally empties.

Bacterial and chemical analyses of the effluent from this plant have been made in Philadelphia, and these show high results, as the accompanying statement indicates.

Usually about one-half only of the filtering area is in operation, the other half being rested, aerated and cleaned. The cleaning operation involves the daily removal of about two tons of the sand on the top of the filters which has become clogged by the organic matter still remaining in the coke-strained effluent. This daily loss of sand costs about $2 for the material alone.

Reverting to the preliminary operation undergone by the crude sewage in the receiving chambers at the terminus of the main sewer, there are two suspended layers of coke twelve inches thick through which the sewage must pass. The upper one holds back the coarse sludge, while the lower effects a partial filtration or straining of the sewage before it is taken hold of by the pumps. Every week the sewage is shunted from one receiving chamber to the other, and the clogged coke of the upper strainer is entirely removed, hoisted to the drying ovens, and finally consumed under the boilers as ordinary fuel. The weekly removal of clogged coke from the upper strainer is about five tons.

In my opinion the clogged coke should be removed at more frequent intervals and the coke should be, not commercial coke such as I saw, but breeze, or ordinary coke broken up into very small fragments. I believe the specifications of the Sanitation Company demanded "breeze," but, since the plant has been turned over to the

corporation of Reading, several changes for the worse seem to have been made.

During last August the cost for steam coal was $72 for 48 tons. In addition to this 16 tons of coke from the receiving chambers were burned. The total quantity of sewage pumped during that month was 49,180,368 gallons.

The cost of this plant has been given to me as follows:

Pumping station complete, with one pump and two boilers	$59,000 00
The pipe line	31,000 00
Site for disposal works	7,000 00
Right of way	1,700 00
Iron structure for filters complete, including viaduct over creek and all accessories	62,300 00
	$161,000 00

As one-half of the upper filtering area is said to be generally out of operation for cleaning purposes, it follows that the daily flow of sewage treated (1,586,463 gallons) passes through the upper filter at the rate of about 2286 gallons per square yard, or eleven million gallons per acre. Although this seems an enormously rapid rate, it must be borne in mind that the second filter below will pass the effluent from the first filter at only half the above rate, and that, with the large amount of aeration obtained, not only by falling through the eight feet six inches air space, but through the last filter, very good results can certainly be looked for. As a matter of fact a very fair sample of effluent was collected by me on the 4th inst.

As regards cost of labor, it is safe to say that four men and a foreman could very well attend to the filters, although at present three foremen and eight men are employed by the corporation of Reading.

Careful examination and inquiry as to the operation of the Reading Sewage Works have convinced me that this practical application of coke straining and aerated filtration is worthy of the very serious consideration of the London, Ontario, authorities, who still have the vexed (and to them doubtless most perplexing) question of their sewage disposal before them.

On account of several conditions essential to successful intermittent filtration through land, which are not always obtainable, this plan is certainly far in advance of land disposal pure and simple, over large areas, as it is generally understood in Ontario, and which I unequivocally recommended three years ago. But this is in reality a land disposal system in a much condensed form, with but a fractional portion of the duty imposed upon it as in ordinary cases, by reason of the prior removal of the bulk of the sludge by coke combustion as already described.

Upon this account, and that of the reduced cost of construction and future maintenance, as compared with other proposed plans, I unhesitatingly recommend it now.

The Pennsylvania Sanitation Company of Philadelphia have offered to construct a disposal plant at the outlet of the Cove Road main sewer, much upon the same lines as that of Reading (the London works, of course, to be a gravitation system), for the sum of $28,000. This is upon a basis of one million and a half gallons of sewage to be treated daily.

I have carefully gone into the plan proposed by them for London, and feel certain that, with certain modifications, which include receiving chambers, coke ovens, furnace and chimney, besides provision for burning the rakings from the upper filter, an excellent system can be constructed for the sum of, say, $33,000.

The company would, I have no doubt, be glad to operate the works for one year, and guarantee a given, satisfactory standard of purity in the effluent.

The whole work necessary in caring for the filter beds, handling, and finally burning, the clogged coke, could be performed by four men and a foreman. The weekly cost for coke (the only material requiring renewal, besides less than a couple of tons of sand daily), would be about five or eight tons, the total weekly expenditure for materials for one week being—five tons coke, say twelve tons sand.

The cost of chemicals alone, per week of seven days, would be, for the "International System," using seven grains of "ferozone" per gallon of sewage (seven grains ferozone per gallon of sewage are not sufficient, as I have found by actual experience: ten grains are necessary), and estimating the cost of ferozone at one-half cent per pound (which is 50 per cent. less than I ever obtained it for)—10,500 lbs. at ½ cent—$52.50 per week, or $2730 per annum.

So much for maintenance, now for the cost of construction by either of the three plans proposed for the city of London:

LAND DISPOSAL.

Forty acres of land @ $175	$7,000 00
Preparing of land	24,000 00
Syphon and other items	10,000 00
	$41,000 00

INTERNATIONAL PROCESS.

Cost of construction as given	$41,300 00
Plan now proposed	$33,000 00

And the latter, besides being less costly, possesses the inestimable advantage of being entirely freed from the sludge nuisance.

The interests of the city of London can be protected by the company's guarantee to keep up a certain standard of purity in the effluent during the period the works are operated by them.

The location of these works at the end of Cove Road sewer would, of course, obviate the necessity for a syphon as now proposed.

The city of Worcester, Mass., may safely be taken as a typical illustration of chemical precipitation for large cities, and the report for 1896 may be referred to, in which it is shown that, for maintenance, and purification of one million gallons of sewage, the cost has been $10.52, 53.9 per cent. of the organic matter having been removed; and yet Worcester is constructing at great expense a filtration plant as an auxiliary to their present method.

The sludge from the Worcester works has always been found very difficult to get rid of, and when there in 1895, I saw very large areas covered with it to a depth of 12 or 18 inches, small quantities of which the neighboring farmers could scarcely be prevailed upon to take away as a gift.

Enough has now been said on this head, and the method of precipitation as applied to large towns with its sludge concomitant, may be dismissed with a quotation from Col. Waring:

"The precipitation treatment buys and manipulates chemicals, coagulates the sludge, drains it, pumps it, handles it, and still has it."

It must not, however, be gathered from the foregoing remarks that the writer has receded from his many previously stated convictions regarding "precipitation" methods.

There are, and always will be, cases arising, where, in the absence of coke or suitable land, chemical precipitation will be found a powerful aid to the final filtration of sewage, either through natural or artificial media; and this applies particularly to the sewage disposal of small communities, *e. g.*, as in some of our provincial institutions, or other small centres of population.

(NOTE: Since presenting the above, I have suggested a still further modification in the method proposed for London, which is to use *only twenty acres of land* for the final filtration of the sewage, after straining through, and retention of the sludge by, coke.

This is a "*combination of the Reading plan with simple land filtration*," and would effect a saving to London in cost of construction of nearly $20,000, as compared with the original "All Land Disposal" plan and the chemical "International System.")

THE FILTRATION OF SEWAGE.

By Capt. W. F. VAN BUSKIRK, A. M., Can. Soc. C. E.,

Stratford, Ontario.

The purification of sewage to an extent sufficient to prevent the pollution of streams and bodies of water situated in thickly populated districts, is one of the most important sanitary measures that cities and towns are forced to consider and pay for. The problem is by no means new and the literature on the subject is voluminous; many plants are in operation and many failures have been made. It is somewhat surprising therefore to find the public so ignorant of the subject that old and incomplete methods of disposal are frequently adopted with no better recommendation than that they have been in use in other places.

The disposal of sewage on farming land is generally attractive, as few people are without the idea that refuse of all kinds may be disposed of and purified on land. This idea is, however, not based on any real knowledge of the chemical and biological action going on in the soil, but has generally been obtained from the unsanitary practices obtaining in all communities and from articles describing the excellent results of successful sewage farming.

Of the newer methods of sewage treatment, much has been written lately, and it is likely that many cities will construct purification plants without taking into consideration the different conditions, and without understanding that there are many difficulties to be overcome before any plant can be operated to the best advantage.

The determination of the degree of purification required in any case and the best means of effecting it are exceedingly difficult problems, and require special knowledge and skill in solving them; and the results obtained by any process will depend to a large extent upon the skill bestowed upon the design and the care exercised in construction and operation.

It is perhaps fortunate that broad irrigation is the method of disposal most familiar to the public, as there can be no doubt that it is the method to be recommended before all others. Unfortunately, however, the primary requirement for successful sewage farming, a sufficient area of suitable and conveniently situated land, is seldom available, and in consequence other methods of disposal must be resorted to.

The best known and most extensively used of such other methods, chemical precipitation, is now looked upon as being merely a sludge-removing process, as it has been found that in nearly all cases further means of purification must be provided in order to remove the organic matter in solution.

The necessity of purifying the effluents from chemical precipitation works has hastened the development of artificially constructed filters, and the great cost of tanks and precipitants has made it necessary to devise other methods of sludge removal.

The process of purifying sewage has thus become separated into two distinct operations: First, the removal of sludge or suspended matter; second, the removal of dissolved impurities.

The former may be accomplished in many different ways, but the latter can only be accomplished in practice by filtration or by broad irrigation.

Sludge is commonly removed by one of the following methods:

1. Mechanical straining.
2. Sedimentation.
3. Chemical precipitation.
4. Rapid filtration through coarse material having air drawn into or forced through the filter.
5. "Septic tank" treatment or putrefaction.
6. Treatment in "digesters" or "bacterial filters" of coarse material.

It is interesting to note that the most recently devised methods of sludge removal, with the exception of the septic tank system, are similar to the methods in use for the removal of dissolved impurities, and that all of them are designed to effect the decomposition of the solid organic matter by the action of the organisms contained in the sewage.

The experiments made at Lawrence, Massachusetts, and described in the reports of the State Board of Health, show that better results in further purification are possible when the process of removing sludge is similar to that following. It is stated that the effluents from rapid filtration tanks or beds become changed by chemical and biological action to such an extent that they do not give off offensive odors for some considerable time, and in consequence, are in a more favorable condition to be acted upon by the nitrifying bacteria in the second filter.

The removal of dissolved impurities contained in sewage can only be accomplished by the action of bacteria, that is nitrification, and such action cannot take place in the absence of air. The power of any filter to purify sewage is shown by the Lawrence experiments to depend upon its ability to hold the sewage in contact with the bacteria

existing on the surface of the particles composing the filter, in the presence of air, for a sufficient time to insure nitrification. It has therefore been found necessary to use filters of fine material and of considerable depth in order that the liquid may not run through from top to bottom too quickly. These conditions necessitate a moderate rate of filtration per acre, and great care in operation to prevent clogging of the surface layers.

Recent practice and experiments both at Lawrence, Mass., and in England, have shown that the excellent results obtained with sand filters may also be obtained with filters of coarse materials operated in a rather novel manner. These filters have a large proportion of open space and are provided with valves on the effluent pipes. The liquid is taken immediately into the body of the filter and kept there for a time sufficient to insure the desired action; the valve on the drain pipe is then opened and the charge allowed to run off from below, air being thus drawn into the interstices. The filter is then allowed to stand empty for a short time previous to another filling, and is also allowed a longer period of rest every seven or eight days.

These periods of rest and aeration are necessary for the establishment and cultivation of the organisms by the action of which purification is attained.

Mr. Dibdin, chemist of the London County Council, in a report to that body dated the first of November, 1896, thus describes the complex process going on within these filters:

"The ordinary putrefactive and other similar organisms commence the work by breaking down the organic compounds and converting them to less complex forms, principally water, carbonic acid and ammonia, the nitrifying organism then acts upon the ammonia, the nitrogen being converted into nitric acid."

It is evident therefore that no new principal is involved in the design of these so-called "bacterial filters," but that the object of passing sewage through any filter, that is to bring the organic matter into contact with the bacteria located upon the particles composing the filter in such a manner that they will act upon it without being destroyed, is attained by an alteration in construction and operation from those with which we have become familiar.

The experimental filter of coke breeze described by Mr. Dibdin in the report above referred to, and the filters in operation at Sutton, have proved that it is not only possible to purify sewage after the sludge has been removed, but that the sludge itself may be removed and destroyed by filtration. In order that this may be accomplished it would appear that the bacteria of putrefaction as well as the bacteria of nitrification must exist in these filters. This, of course, Mr. Dibdin

has mentioned, but it is nevertheless difficult to understand how it is possible in practice to cultivate in one filter both anaerobic and aerobic bacteria, and at the same time to prevent disease germs from passing through the filter.

No doubt the experiments and tests, at present being made both in England and at Lawrence, will clear up all uncertainties of this nature, and it is to be hoped that information will also be gained in regard to the action of these filters during very cold weather.

THE FARM WELL.

By FRANK T. SHUTT, M. A., F. I. C., F. C. S.,

Chemist, Dominion Experimental Farms, Ottawa, Canada.

The water supplies of cities and towns have, during the past quarter of a century, received much, I may say an ever-increasing, attention from sanitarians, water analysts and civic authorities. The public also, now-a-days, in every city and large town, are fully alive to the hygienic value of pure water, to the danger of using from an impure supply. Convinced of the vital importance of this matter, care is taken in the first place that water intended for the use of a community is obtained from a pure supply, and then by thorough and frequent chemical and biological examination, watch is constantly against contamination. There are, no doubt, in many parts of America, as in other portions of the globe, water supplies of greater or less magnitude which cannot be considered first-class and others that may be classed as of doubtful purity, but this does not affect the statements that, speaking generally, there is the vigilant eye of science guarding the health of our citizens through the water they drink and that public opinion is ready to support the conclusions and recommendations of those who have made water and water supplies their special study.

Unfortunately, however, the quality or purity of the water used in our rural homes has not been, in the past, a matter of much moment to any one, and least of all to those most concerned, unless some serious outbreak of disease appeared. It is not within the province of a board of health, under ordinary circumstances, to examine or interfere with the farm well, and the apathy exhibited by farmers and villagers upon this important question has been a matter of serious concern to those who had reason to expect that the condition of affairs in this respect was far from satisfactory. It was the firm belief of the writer, when he assumed the duties of Chemist to the Dominion Experimental Farms, some ten years ago, that many farmers, their families and their stock were drinking water contaminated to a dangerous degree with excrementitious matter, and further, that many cases of typhoid fever, diarrhea and other disorders of the alimentary tract, all too prevalent in our farm homes, were the direct results of the use of such waters.

To learn the truth as to this conjecture, as well as to awaken an interest in this matter of pure water among our rural population, it

was decided, with the consent and concurrence of the Minister of Agriculture, to make analyses, free of charge, of all samples from farm wells that were collected and shipped in accordance with certain instructions (forwarded upon application) and that the express charges were prepaid. It was also made a *sine qua non* that the samples be accompanied by full information respecting the well and its environments. Farmers from Prince Edward Island to British Columbia have taken advantage of this privilege, and as a consequence we have now on record the results of more than a thousand analyses of waters from Canadian farms. These results, published from year to year in the reports of the Experimental Farms, are most significant and disclose a condition that certainly calls for reform. For, stated in round numbers, they show that not more than twenty-five per cent. of the samples examined could be considered as "first-class," that twenty-five per cent. must be regarded as "suspicious" or of extremely doubtful purity, while the remaining fifty per cent. would be, by reason of serious pollution, utterly "condemned for drinking purposes." It is of interest to add here that, respecting the latter class of waters, we have, in many cases, information that gives the fullest corroboration for the conclusion drawn from the analytical data. Indeed, it has been our frequent experience to learn, upon investigation, that the health of the families from which the contaminated samples were obtained had suffered from typhoid, often resulting fatally; diarrhea and kindred diseases were in many cases reported.

In speaking to members of this Association, it is not necessary, I am sure, to dwell at any length upon the danger to health from using polluted water, but there are two phases of the question to which I wish briefly to refer. The first is what I may term the chemical action of impure water. We all, now-a-days, recognize how certain well-known germ diseases may be spread by the use of polluted water, but apart from the danger of the introduction of pathogenic organisms, I am of the opinion that water containing decomposing organic filth may, and often does, act as a direct poison, probably due to the presence of the ptomaines. The effect of such water upon the system may be immediate, causing acute diarrhea, vomiting, etc.; or, on the other hand, it may be insidious, slow and unnoticeable at first, but not the less sure in its effect. It is, I believe, the origin of many complaints generally arising from a disordered condition of the intestinal tract. From a study of this question I have been further led to the belief that water of the character of which I am speaking is largely instrumental in undermining the constitution and lowering the whole tone and vigor of the system, probably rendering its victim

the more liable to catch any disease that may be prevalent or to succumb to any attack of constitutional weakness or the results of any accident that may happen. If it is true that the general health may be impaired in this way, as it were, without our knowing it, we have the greater reason for vigilance, the greater reason to put our people on their guard against what may be to them a treacherous foe.

The second point in this connection, when speaking of impure water on the farm, that I would dwell for a moment upon, is that, besides being a menace to the health of the farmer and his family, the continuous use of polluted water must affect the health and thriftiness of his stock and the wholesomeness of his dairy products. These are further matters upon which we are not without proof. First-class butter nor cheese cannot be made when the water at the farm, dairy or factory is polluted.

Before proceeding to state the principal causes of impure water on the farm and the possible means of improving the present condition of affairs, it is only right that I should point out that the results of water analyses here brought before your notice do not necessarily represent the condition that prevails universally; in other words, they do not imply that a similar percentage of polluted farm wells exists throughout Canada. We may rightly suppose that it is only of the number who have reason to strongly suspect the purity of their supply who forward samples. Nevertheless, the samples being collected over such a wide area, our data reveal that a most unsatisfactory condition of rural water supplies in general exists, one that we cannot emphasize too strongly when bringing this matter before our agricultural people.

The cause of this lamentable condition is not difficult to find. The data almost invariably point to the presence of excrementitious matter. The information furnished us, and our own observation, show that, in the majority of cases, the farm well is merely a hole of greater or less depth sunk in the barn-yard or under one of the farm buildings, at other times dangerously near the pig pen, or privy (usually a mere hole in the ground, with no provision for cleaning), or close to the back door, from which it is quite a common practice to throw the waste water of the kitchen and not infrequently that from the bedroom. So-called spring water one often finds to be but soakage and surface water, the well really acting as a cess-pit. Our reports show that many waters examined have had a distinct value for the fertilizing elements they contain. To those who are in the least conversant with the condition of barn-yards in general, it is no matter of astonishment that the well water is reeking with manurial matter. Through carelessness or ignorance a very large proportion of the most valuable

part of the manure on many farms is allowed to go to waste. Lack of sufficient absorbent bedding, general untidiness about the building and the exposure of the manure pile are the most frequent causes of this loss of plant food and the pollution of the farm well. Further, no provision is taken to keep out surface soakage by lining the walls of the well with cement. No words of explanation are necessary to account for contamination of the supply when the well is situated in the vicinity of one or the other of the sources of pollution mentoined, for it is very rare to find any precautionary drainage system to prevent the liquid filth from soaking into and saturating the ground.

It would be quite a simple matter to dilate upon the various ways in which the water of the farm well will become foul. Such, however, scarcely is necessary. A harder task is to work a reform. As far as I can learn it does not appear to be the duty or within the jurisdiction of any board of health to interfere with the farmers' water supply, save under exceptional circumstances, as for instance where the health of a community is involved or when milk is sold to city consumers. Like in many another question, improvement for the individual must come by education, not legislation. Realizing this, the authorities of the Experimental Farms, an institution established in the interests of farmers, were led to do the work that I have referred to, and by lectures, as well as distribution of reports and bulletins, to inform our people of the danger that lurks in polluted water. Regarding impure water, the old adage "prevention is better than cure," is doubly applicable, for it is seldom that any cure, as far as the well is concerned, can be effected. Boiling all water used for drinking purposes is certainly a safeguard against disease producing germs, but it cannot be said to make the water pure, since the decomposing organic matter is not removed. There is evidence that boiling destroys those poisonous substances which appear to be present in many impure waters and to which I have already referred, but the operation can at the best only be regarded as a safeguard. Ordinary household filters are, in many instances, worse than useless; though there are certain filters, such as spongy iron, porous porcelain, that would, if properly managed, improve the quality of the water. The filters one usually finds in the market, as we are all aware, are quite ineffective for purifying polluted water. They simply remove suspended matter.

In those cases where there is an inflow of drainage matter into the well, it is more than probable that nothing can be done with the supply. The well must be abandoned, for the surrounding soil is saturated with filth, and providing the cause could be removed, years

must elapse before water passing through such soil would be wholesome.

From these considerations our work for farmers in this matter falls into two parts: First, the determination of the quality of the well water, and second, the pointing out how health may be impaired by the use of contaminated water and the giving of advice as to how a pure supply may be obtained and preserved. With regard to this latter phase of the question I would, in conclusion, say a word or two. Our advice, put briefly, is as follows:

1. If possible, utilize a spring or pure stream some distance from the farm building, and if gravity cannot be used for bringing the water in pipes, a windmill pump or ram, neither of which are expensive affairs now-a-days, should be employed. If, however, it is necessary to sink a well, place it at a sufficiently safe distance from all sources of contamination as to be beyond possible contamination. No matter how impervious the soil may appear to be, never sink the well in the barn-yard or under a building containing animals. Convenience should be sacrificed, but health should not be jeopardized.

2. Surface and local soakage water should be kept out by lining the well with brick or stone, laid in cement, to the ground water line.

3. The well should be protected by a closely fitting top, projecting slightly above the level of the ground.

4. The well should be examined and cleaned periodically, as frogs, rats, mice, etc., frequently find therein a watery grave.

5. Garbage, household slops and the like should never find a resting place near the well. Their proper place is on the compost heap.

6. The well should never be used as a cold storage receptacle—accidents will happen. Neither should the milk cans, etc., be washed at the well unless there is a very efficient drainage therefrom to carry to a safe distance the waste water.

The subject of cleanliness about the farm buildings is as intimately connected with that of pure water as with that of economy in fertilizing material; but in this connection I shall at present only say this: That we have found moss-litter and air-dried swamp muck excellent absorbents for use in and about farm buildings. Deposits of these naturally-occurring fertilizers are to be found in many localities throughout the Dominion and frequently may be obtained for the expense of hauling. They are materials rich in nitrogen and therefore valuable in themselves as fertilizers. Their free use in and about farm buildings where there is liquid manure to absorb will be found profitable and at the same time valuable in keeping the surroundings healthy, and possibly the well water pure.

We purpose, at all events, for the present, to continue this useful work of examining farmers' water supplies and the dissemination of knowledge regarding the evils of impure water, with a result, we hope, of bringing about a much better state of affairs than that we have reported to-day. Indeed, we have reason to believe that our work in this connection has already borne good fruit and that the future will show it to be not the least valuable of the investigations undertaken by the Dominion Government for Canadian farmers.

AN OUTBREAK OF TYPHOID FEVER DUE TO AN INFECTED PUBLIC WATER SUPPLY.

By JOHN L. LEAL, M. D., Health Officer, Paterson, New Jersey.

My reason for reporting the following outbreak is that it seems to me to aid in establishing the fact that a single case of typhoid fever may so infect a large body of water as to reproduce itself among those dependent upon the same body of water for their public supply, even though said supply be taken at a point some distance from the point of infection.

Most of the well-authenticated outbreaks of typhoid due to infected water supplies belong to one of two classes:

First. In which the water infected is small in bulk.

Second. In which the infection is great and its action more or less continuous.

In the outbreak which I am about to report to you the bulk of water infected was large, its infection was sharply defined and its origin, I believe, was in one case of typhoid.

In Paterson, N. J., a city at that time of 103,000 inhabitants, there developed, between September 15, 1896, and January 1, 1897, two hundred and thirty-three cases of typhoid fever.

These cases developed as follows: During the last half of September, twenty-six cases; during October, forty-one cases; during November, one hundred and eight cases; during December, fifty-eight cases.

The typhoid rate had been normal before September 15, and immediately fell to normal after January 1, only seven cases developing during January and February. For the same period—September 15 to January 1—for the five years preceding 1896, the average number of cases had been fifty.

It is evident from the above that some special cause must have existed in order to account for this great, sudden and sharply defined rise in the typhoid rate.

A careful general investigation, as well as one of every individual case, was made, with the following results:

The disease was evenly distributed throughout the city, except in one district, containing about two thousand people, and among all classes of the inhabitants.

No particular neighborhood or special class of the population was affected.

The cases could not be divided into groups in any way.

There was no common milk, ice or food supply.

No possible common means of infection could be found except the public water supply, upon which all of those affected, with the possible exception of two or three, were dependent for at least a portion of the twenty-four hours.

It also appeared that the only section of the city which did not contain a single case of the disease was also the only section not furnished with the public water supply.

The condition of affairs existing in the city of Passaic, 18,000 inhabitants, situated about five miles below Paterson and supplied from the same intake and reservoirs, was investigated.

It was found that between September 15 and January 1 sixty-eight cases of typhoid had developed there.

The normal number for the same period would have been about ten.

The source of the water supply for both cities is the Passaic river, the intake being at the Great Falls, within the limits of the city of Paterson. From this intake are pumped daily about 20,000,000 gallons of water to the distributing reservoirs.

About 18,000,000 gallons are used in Paterson and 2,000,000 in Passaic. The average daily flow of the Passaic is about 500,000,000 gallons. The flow within the limits of the time specified was considerably above the average.

The current is about one-sixth of a mile an hour.

Beginning September 23, chemical and bacteriological examinations of the waters of the river were made with the following results:

Above Little Falls, a village situated three miles above the intake, the water was found to be of good character, showing chemically no evidence of harmful pollution, and bacteriologically no common colon bacilli and an average of three hundred bacteria to the c. c.

Below Little Falls, chemical evidence of harmful pollution was found, the average number of bacteria per c. c. was six hundred, and in ninety per cent. of the specimens examined colonies of the common colon bacillus appeared. On a specimen taken at the intake on September 23, Dr. Connolly reported as follows:

"Tests for typhoid bacilli revealed the presence of a non-liquifying active motile bacillus, which did not produce gas in the presence of culture media containing sugar, nor did it produce indol, and in other respects was identical with the typical bacillus of typhoid fever."

The chemical part of the above examination was made by Professor H. D. Cornwall, of Princeton University, and Mr. H. B. Baldwin, of Newark; the bacteriological part by Dr. R. N. Connolly, of Newark, and Dr. H. D. McCormick, of Princeton.

A careful investigation of all known cases of typhoid fever within the drainage area of the river, and a house to house inspection for the purpose of discovering unknown ones, showed only one possible source of the infection.

A resident of Little Falls returned from a summer resort ill with typhoid fever on the twenty-eighth of August. The fever subsided about the first of October, but a relapse followed, lasting from about October 8 until the end of the month, when final convalescence began. The water closet receiving the discharges of patient was connected with a series of cesspools, connected with each other by overflow pipes, and the last cesspool of the series discharged through a hidden pipe into the river. These cesspools, having thus become infected about the first of September, continued to receive fresh infection until about the first of November, when the patient was actually convalescent.

The conditions existing in the cesspools being favorable to the growth and development of the specific bacillus, such infection became more and more virulent, continuing after all fresh infection had ceased. Thus the river had been more or less continuously infected by these cesspools from about September 1 until November 24, when said discharge pipe was discovered and further infection from that source prevented. Not more than twenty-eight of our cases were infected after this date, and of the twenty-eight cases, eighteen were infected within the first week and seven within the second week after it.

Thus it appears that within two weeks of the shutting off of fresh infection, the typhoid bacilli already in the river had practically disappeared, owing to surrounding conditions not being so favorable as in the cesspools and to the effect of the downward flow of the current.

It seems reasonable to believe, however, that the infection of the river, with its attendant results, might have continued indefinitely, owing to the conditions favorable to bacterial life existing in the cesspools, had not those sources of infection been discovered and cut off.

REPORT OF THE COMMITTEE ON CAUSE AND PREVENTION OF INFECTIOUS DISEASES.

By PETER H. BRYCE, M. A., M. D., Chairman, Toronto, Ontario.

Mr. President and Gentlemen—Your committee has found it difficult to gather such data of a new character regarding the microorganisms which cause one or more of the infectious diseases as would authorize them to devote any considerable length of time to this portion of the subject. The chairman had hoped, by selecting gentlemen of the committee specially qualified to deal with some particular disease, to have been able to have the last word up to date spoken by your committee on each. It was hoped that Surgeon General Sternberg would have spoken concerning yellow fever, but other pressing duties have prevented. Dr. Jésus Monjarás has, as will be seen, written regarding typhus fever, and said, I think, the last word up to date, while Dr. Suiter has, in a valuable report, made a resumé of the principal features of scarlatina. Dr. Hewitt, as will be seen from the appended report, dealt very fully with diphtheria. I had hoped for much from my other coadjutors, but they, too, have been prevented from reporting on the subjects assigned. In view, however, of the supreme importance of the subject assigned to the committee, its chairman has thought it proper to bring before the Association, not only what has been said by his coadjutors who have reported, but also to touch upon some points which have practical bearings on our work as sanitarians.

In making a survey of the subject, it is apparent that we must realize, as in classifying plants, that the infectious diseases fall into several divisions, both as regards their mode of causation and their growth and development.

Dr. Clifford Allbutt classifies them as follows:

1. Infectious diseases of chronic course: as tuberculosis, leprosy, actinomycosis.

2. Diseases of uncertain bacteriology, (*a*) not endemic: as measles, rubeola, scarlatina, smallpox, chickenpox, whooping cough, mumps; (*b*) topical or endemic: as typhus, dengue, yellow fever, dysentery.

3. Infective diseases communicable from animal to man, (*a*) of certain bacteriology: as glanders, anthrax; (*b*) of uncertain bacteriology: as vacuma, foot and mouth disease, rabies, glandular fever.

4. Diseases due to protozoa: as malaria, amœbic dysentery.

In order to get information bearing upon the several diseases, with a hope that I might present the results in tabular form, I asked that the relations of the several diseases to soil, climate, etc., be touched upon, but the information supplied has not been sufficient for the purpose.

From the practical standpoint, too, the composition of this committee supplied the means of getting information from statistical and general officers, as State officers, as to the results of any disease, from municipal officers, with full knowledge of details, as to modes of causation, and of those from the laboratory, who would have dealt with the same *ab initio;* but, as stated, our efforts have been but partially successful.

It will be apparent, however, to even a superficial observer, that the subjects which this Association deals with to-day are not, in a large degree, those which troubled us greatly fourteen or twenty years ago. Excepting, perhaps, about the mere germ itself, we seem to have learnt pretty much all about smallpox, for instance; vaccination and compulsory isolation with effective cleansing, ends the matter, and we set down six weeks of isolation as a finality and move on. The same may largely be said for scarlatina, except that in practice the adage of the celebrated Sydenham, quoted by Dr. Suiter, regarding the mildness of the disease when first differentiated, "*vix nomen morbi merebatur,*" may to-day be so often repeated regarding it that the working physician and municipal health officer find it very difficult to accept the still accepted rule of English hospital practice of isolation for a minimum of forty days.

In the diseases, measles and whooping cough, in both of which the germs have still eluded research, we find health officers still struggling with the difficult problem which health officers everywhere meet with, that of the practical control of two diseases, which, through their common mildness in the families of the well-to-do, still cause amongst the children of the poor, in crowded centers, at least, more mortality than from either of the other two pests referred to. It may be stated as a general conclusion that until regular medical supervision of the public schools becomes a recognized part of municipal health work, no great advance over the present *laissez faire* methods is to be expected.

As regards diphtheria, regarding which, owing to the notable advances made, both in its diagnosis and treatment, a complete resumé of the work of the past four years should properly have been submitted, the member having the matter in hand has reported very fully. Regarding the disease, it may suffice to say, that the past year has still more clearly demonstrated, from the biological standpoint, the dis-

tinctive differences marking true diphtheria from the allied *pseudo* forms. Perhaps the most interesting facts in the extended investigations go to show that in all communities where the disease has existed or become in some degree endemic, a notable proportion of all throats examined of children showing no symptoms of the disease, shows the existence of the bacillus, present as a saprophyte, at times virulent in experimental inoculation of animals. The experiments of Professor Wesbrook, presented in a paper read in Montreal last year, illustrated the fact in a case where the disease had become endemic in an orphanage, while results in investigations by Mr. J. J. MacKenzie, Bacteriologist of the Provincial Board of Health of Ontario, upon children, inmates of the Children's Hospital, Toronto, add further corroboration of the fact.

As regards the methods for suppressing outbreaks of diphtheria in a community, further experience in Ontario during the past year has shown that the following seems the most effective and prompt means of stamping out an outbreak. In a number of municipalities where the disease appeared, as it always does, principally amongst school children, the practice was introduced of a morning visitation by the sanitary inspector to all the public schools to obtain a list of the day's absentees. The homes of these were promptly visited, and where any evidence of malaise or sore throat was present, the parents were at once required to send for the family physician and have a swab taken and forwarded to the medical officer by the afternoon. Where neglect occurred the medical officer was notified, who then visited the family and took a swab. These were sent at once by mail to the Provincial Laboratory and the patient isolated until an answer by telegraph of the result of the examination was received. Where the cases proved to be diphtheria the patient was isolated until further examination proved the freedom of the throat from bacilli. The children of the household were kept from school and the public, and the house subsequently disinfected with formaldehyde, where the child had not been removed to the hospital. It may be mentioned that the greater safety of the family and the more assured recovery of the child, not to mention the convenience to family and the economy of the procedure, have so commended themselves to the people that cottage hospitals are yearly growing in favor. It need hardly be said that the most progressive physicians and municipal authorities report yearly the increasing use and efficacy of antitoxin as a curative agent in diphtheria.

Typhoid fever and those allied diseases, typhus, cholera, yellow fever and dysentery, or those zymotic diseases in which the digestive tract is the principal seat of their pathological manifestations, are a

group which, in spite of all the work that has been done towards their elucidation, still stand prominent as a "will o' the wisp," leading bacteriologists onward to a seeming certainty of conclusions, only to elude their grasp at the moment of looked-for success.

The Cuban campaign, as well as the epidemic in the Southern States in 1897, has lent a new interest to yellow fever for members of the Association, who ordinarily are beyond the sphere of its influence. In the absence of a report from Surgeon General Sternberg, that member of the committee who could have told us so much, it does not seem desirable to refer to those investigations into the cause of the disease which may still be said to be incomplete.

As regards typhus fever, it is with pleasure that we are able to produce here some of the very practical and scientific remarks of Dr. J. E. Monjarás, of San Luis Potosi, dealing both with the causation and the prevention of the disease. After referring to the statistical studies of the disease in that city from 1892 to 1898, during which time he had charge of the health department of that city, and studied an epidemic causing eight hundred and fifty-one deaths, Dr. Monjarás makes the statement that the tables published show that there is no period of the year, and even no day of the year, when we can say that no person in the city is suffering from typhus. Meteorological circumstances, such as cold, heat, atmospheric humidity and pressure do not, taken by themselves, show any clear, precise and constant connection with the number of deaths. "Of the telluric influences, that of the rainfall, which plays so great a part in epidemics of typhoid fever and cholera, does not exercise any great influence in the development of typhus; and there is no clear evidence that sewage emanations play a very important role in its development." "Neither can we trace its existence, in an indisputable manner, to the drinking water that is used in the city, and no evidence exists that any occupation exercises any special influence on the disease." "The same cannot be said as regards the social position of the persons attacked; and the exact data that I have been able to collect during the last three years clearly show that the poorer classes are those which furnish the greatest number of victims, amounting to seventy-two per cent. of the total cases. The disease, though attacking well-to-do persons, has always made its first appearance in the huts of the poor quarter of the city. During the prolonged epidemic lasting from October, 1892, to December, 1893, the years of the great drought, charitable persons opened soup kitchens in different parts of the city, where they fed the poor twice a day. "The persons employed in this service were amongst the first victims of typhus, which later invaded the entire city." Based upon these studies, Dr. Monjarás concludes: "I be-

lieve pauperism constitutes one of the principal etiological causes of typhus, and that the extinction of pauperism is the best prophylactic measure against typhus." While it is true that the disease has increased in winter, Dr. Monjarás believes this not due to the cold directly, but to the crowding, especially of the poor, into badly ventilated rooms, and the want of an open-air life, such as they have during other seasons.

These remarks are most interesting, as indicating an essential distinction between this disease and typhoid, cholera and yellow fever; those diseases which, with malaria, lead us back to that oldest of problems, the relation between them and the organic matter of soils and of ground water.

They are further important, confirming, as they do, for the western world, in large measure, the conclusions held regarding typhus, by health officials and physicians, both in Europe and in the crowded cities of India and China.

In an association formed of representatives of a whole continent situated in the temperate zone, where typhoid tends to prevail, it is most natural that any progress made in an exact knowledge of typhoid fever should be referred to. In this, as also in the mode of dissemination of malaria through the agency of mosquitos, the past year has seemed to have added somewhat to our positive knowledge.

Sir Joseph Fayrer, writing regarding malaria in India, speaks frequently of the degrees of virulence in its manifestations; in other words, of variations in the virulence of the germ. He states that, in different localities, and under different circumstances, malaria varies greatly in intensity. Often mild, it may assume, with the failure of food-supply and favoring meteorological conditions, the character of a dominant and destructive epidemic; and he suggests that simple ague, cachexia and neuralgia, and the severe remittents, according to varying localities, are but variations in the source of the micro-organism; and that further, differences in age, race and personal susceptibility, under varying sanitary surroundings, account for the different types the disease assumes.

Similar variations in the virulence of the type of bacilli are, as we now know, the common experience in the cultivation in both the germ for the production of diphtheria toxin, and in the results of inoculation experiments with different samples of toxins on animals.

From the experimental studies of Dr. Sydney Martin, of London, England, recently published, and from his views of the results of other workers, we are now able to say that the bacillus typhosus is subject to at least equally great variations of virulence, and that it, as well as its allied forms, bacillus coli and bacillus enteriditis of Gærtner, may

by successive bacterial passages through animals, when inoculated with other forms, as a streptococcus or bacillus prodigiosus, increase the virulence in the toxic products produced by their subsequent culture in broth.

He seems to have added still further proofs that these three bacilli, though allied, are absolutely distinct from each other; but, on the other hand, has given us experimental proof of how readily bacillus coli may take on a pathogenic virulence. This would seem a point of prime importance, since we have constantly arising a problem, hitherto wholly unexplained, of why, whether in the new mining camps of Western Australia, in the Transvaal, the mountains of Idaho, or in the Klondike, within the sub-arctics, the prospector has only to locate his claim and settle upon it, disturb the virgin soil and allow, through neglect, excretal pollution of such soils near the camp, when within a few weeks, enteric fevers with typhoid characteristics, will develop. Or still more interesting is the fact that the lumber camp need only be located on the shores of some lakelet in the Northern Laurentides of Canada, in the late autumn, with its drainage flowing towards the lake, and in spite of the intense cold, excretal pollution reaching, beneath the ice, the waters, rich in vegetable organic matter, will, before the springtime, produce an outbreak of enteritis, with typhoid symptoms.

Hitherto we have been forced to explain such outbreaks by supposing always that some vigorous young man has gone to the mining or lumber camp as an ambulant case of typhoid, or if this supposition seemed too ridiculous, we have recently had to assume that the bacillus typhosus is a hemi-saprophyte (or facultative parasite), practically always present in the intestine of man, benign and non-virulent, but differing from bacillus coli in playing no part in digestion.

Sydney Martin points out that bacillus coli differs from the other two in that it causes decomposition of proteids, that it is found in foul water and in soil, and after death penetrates the different abdominal organs, and is one of the causes of putrefaction in the body. He further tells us, "there are, no doubt, many different forms of the bacillus coli," which vary greatly in virulence. Martin states that he found it much easier to increase the virulence of bacillus coli than of either of the other bacilli, and that with fourteen days' culture, 4 c. c. of a broth culture caused death in a large guinea pig in twenty-four hours. With such a ready increase in virulence on the part of this normal saprophyte of the intestine, and in the absence of Widal's test, it does seem that we now have a reasonable explanation of the occurrence of outbreaks of fevers with the enteric symptoms; since Martin's experiments with cultures of high virulence show that inoculations

of the poison, while producing no peritonitis, did produce petechias, both beneath the peritoneum and on the mucous membrane of the ileo-cæcal region and cæcum with profuse diarrhœa.

The results of these experiments have seemed of so much practical importance, as directing our efforts for the prevention of typhoidal diseases, as to excuse this lengthened reference, since your committee is convinced that any doctrine which teaches the general existence of bacillus typhosus as normally present in the intestine, and that the typhoid germ may, therefore, develop in virulence at any moment, and so produce disease, would be dangerous and subversive of the belief of the past twenty years, which has increasingly been taught as a truth, that "maintain the drinking water of a city, or, indeed, of any place, free from the excretal pollution of man and animals, and typhoid fever will not occur; while, on the other hand, allow excretal animal matters to find their way into drinking water, and typhoidal diseases will sooner or later break out."

This report would not be deemed in any degree complete did it not refer briefly to the progress in our knowledge, both with regard to the inoculation and dissemination of, and to the prevention of tuberculosis.

Regarding inoculation with the bacillus tuberculosis, Dr. Hugh Walsham, of London, England, in a remarkable paper giving the results of his pathological investigations, quotes Dr. Sims Woodhead, who says: "I am driven to the conclusion that this method of infection of the glands of the neck through the tonsils must be of a comparatively frequent occurrence, especially in children living under insanitary conditions and subjected to various devitalizing influences," and proceeds to cite the experiments of M. Dieulafoy, before the Academy of Medicine, Paris, who obtained a number of portions of tonsils and adenoid vegetations, removed on account of hypertrophy. With material taken from twenty-one cases of hypertrophied tonsils and inoculated into guinea pigs, eight became tuberculized; and of adenoid vegetations from thirty-five cases, seven guinea pigs became tuberculized. As objections were made that the bacillus might be in mucus and not in the tonsil, Dr. Walsham made sections of tonsils from persons who had died in the hospital, in most cases from tuberculosis, but who had not apparently suffered from tonsillar tuberculosis. Microscopic examinations showed that twenty out of thirty-four cases had tubercular tonsils. While not finding tubercles in portions of hypertrophied tonsils removed from living patients, he quotes Dr. M. Lennoyez to show that tubercular adenoids and tonsils do exist, and that general infection has at times resulted, owing to the wound made by their removal. He concludes:

First. That the tonsils are very frequently affected.

Second. That tubercle may be primary in the tonsil.

Third. That they are frequently infected secondarily in pulmonary cases.

Fourth. That the cervical lymphatics are frequently affected from them.

Fifth. That the tonsils may be affected from without or through the blood stream alone.

Other experimenters seem to have obtained positive results as regards the mucous tissues of the nose, and it would indeed be strange were it not so, where we find the following results from Pflugge's experiments regarding the dissemination of dust and germs of disease by air movements in houses. He pointed out:

First. That, owing to technical errors, the older observations upon the rate of air movement necessary for the lifting of bacterial parasites into the air gave too high a figure as a unit. He places it at about four metres per second.

Second. That once particles have been thrown into the air, they remain floating for hours (six hours), and may be carried from one part of a room to another by currents of very slight intensity, less than two millimetres per second.

Third. That bacteria-holding droplets of fluid are always thrown into the air by a fit of coughing, by sneezing or by loud talking, and these droplets are so small that they may be found floating in the air for at least five hours and are carried about by currents of exceedingly low intensity.

Fourth. That slides supported in front of coughing consumptives are frequently found to be covered with tubercle bacilli, either isolated or in small groups, and that they must have been associated with the small particles which he found would float for such a time in the air.

Fifth. That particles may be thrown a distance of thirty feet by an ordinary fit of coughing.

Sixth. That experiments with the dust of dried sputum on animals have practically always shown that it is not possible to produce inhalation tuberculosis in that way.

Seventh. That, in those cases where inhalation infection has been successful, sprayed moist sputum has always been used.

He concludes that in diphtheria, scarlet fever, consumption, influenza, etc., there is more danger from the infecting agent thrown into the air by the act of coughing than from dust derived from the same material.

Still more recently, Neisser, of Breslau, in a recent paper, points out that the air currents which obtain in an ordinary room, *i. e.*, current of ten centimetres per second, and twenty feet per minute, seem unable to

carry certain bacteria in a living condition. That is, that air currents of such slight character can only carry the driest dust, in which many bacteria have previously been destroyed.

From a long series of experiments he concludes that the following bacteria are not carried by such currents:

B. Diphtheriæ.	Vibrio Choleræ.
B. Typho-abdominalis.	Pneumococcus.
B. Coli communis.	Streptococcus pyogenes.

The following are carried:

Strept. pyo. aureus.	B. Anthracis.
S. Pyocyaneus.	B. Tuberculosis.

German observation seems to controvert this in regard to the diphtheria bacillus and the pneumococcus, which resist drying for a long period.

Such experiments give point to the results of statistical studies of deaths from tuberculosis. It has long appeared evident that the disease has, so to speak, attached itself to certain houses, and by Dr. Gerhardt, of the New York City Health Department, it has been found:

First. That in a single ward of the city (No. 4), where there are six hundred and sixty-three houses, with 18,223 population, or 27.6 to a house, two hundred and forty-eight houses, or 37.3 per cent. of the whole, had, during some one of the years 1894, '95, '96, cases of consumption, or the total cases were five hundred and forty-one, or 0.81 per cent for every house in the ward.

Second. That, for the infected houses, there was an average of 2.81 cases.

Third. That the three years showed no great increase of infected houses.

Fourth. That some houses seem so permanently infected and should be either torn down or renovated from top to bottom.

Many similar results might be related from recent statistical studies in many countries and states, but it is of much importance that we should have laboratory experiments completing the proofs of the extreme danger attaching to inmates of the same house where cases of consumption in advanced stages are resident.

The year has shown notable advances in the practical adoption of the principle of sanatoria or hospitals for consumptives, as in Germany, from France and England, as well as on our own continent, a number of new sanatoria based on the "air cure" idea have been erected. Interesting in this connection is the series of resolutions adopted by the International Conference of State and Provincial

Boards of Health at Detroit, in August last, and which have been generally distributed:

WHEREAS, It has been the unanimous voice of the International Conference of State and Provincial Boards of Health of North America, that, since tuberculosis, which causes on this continent more deaths than all other contagious diseases together, is now recognized by all scientific and medical authorities as both curable and preventable; and

WHEREAS, Since the onset of the disease depends especially upon hereditary weakness, and on mal-nutrition induced by over-crowding, bad ventilation and over-pressure in school, social and commercial life; and

WHEREAS, Since the continued presence in the homes of the poor and others of so many cases of this chronic disease means almost certain death to the patient, and probable infection to other members of the family, be it therefore,

Resolved, That this Conference does publish, and instruct the Secretary to forward copies of these resolutions to the legislatures, departments of education and municipal authorities of the several States and Provinces represented in the Conference, urging upon them the imperative need of,

1. Having all schools and colleges placed under proper medical supervision with regard to ventilation, over-crowding and over-pressure in studies;

2. Having all hotels, boarding houses and work shops where consumptives may be employed, placed under municipal supervision and inspection;

3. Urging all State and Provincial legislatures to devote public funds, and to encourage private philanthropy, in the establishment of homes or sanatoria in one or more counties or districts of the several states and provinces, to which tuberculized patients may be sent early, either at their own or municipal expense, and under proper regulations be encouraged to remain therein until recovery shall have taken place; while at the same time they shall have prevented the continuance of centres of infection in their homes.

DR. C. A. LINDSLEY, Connecticut:—I believe that this resolution should be in some way published at once. I do not think it should be held until published in the regular proceedings. I move that the Secretary prepare copies of this resolution at his early convenience and send them to every State and Provincial board of health that they may have opportunity to bring the matter before their legislatures. Motion was seconded and carried.

Your committee feels that it has only touched upon much that might with profit be dealt with at length by it, but it hopes that the resumé of some of the lines of progress in different fields of sanitary work may not be wholly devoid of interest and instruction.

TYPHUS FEVER IN SAN LUIS POTOSI.

By J. E. MONJARÁS, M. D., San Luis Potosi, Mexico.

Before the year 1892, when I took charge of the Health Office, the statistics were of the most incomplete and inexact character, as the death certificates or notices were given by the family of the deceased person, and were always vague and wanting in precision. From June, 1892, no burial has been allowed without a certificate from a physician with diploma, which was forwarded in the original together with a certified copy of the entry made in the register, giving the proper description of the dead person. The data which accompanied this report covered the period between 1893 and 1897, inclusive.

The data relating to the years 1893, 1894, 1895 and 1896, in connection with typhus, have some inaccuracies which arise from the fact that the families of the deceased persons always tried to hide cases of contagious diseases, for fear of the sanitary measures to which they were liable. Even the physicians who attended the sick persons committed this error. It is only by the most energetic penal regulations that, as late as the year 1897, I have been able to suppress this pernicious custom of hiding cases of contagious diseases and especially of typhus.

Typhus is endemic in this city, and from year to year the endemic develops until it sometimes reaches the character of a real epidemic.

That there is no period of the year, and even day of the year, when we can say that no person in the city is suffering from this disease.

The summary for five years shows that during that time we have had 851 deaths, of which 424 were men and 427 were women. With respect to the deaths by age, we have between the ages of birth and 4 years, 13 males and 6 females; between 5 and 19 years, 63 males and 83 females; between the ages of 20 and 39, 216 men and 212 women; between the ages of 40 and 60, and over, 93 men and 100 women.

According to the data regarding the cases of typhus, which also have been brought down from 1893, although with less exactitude than the deaths, we have the following numbers of persons attacked: In 1893, the cases numbered 1373; in 1894, there were 106; in 1895, there were 80; in 1896, there were 107, and in 1897, there were 409.

In studying the causes that have a possible influence on the development of typhus I have observed that the principal meteorological

circumstances, such as cold, heat, atmospheric pressure, humidity and rains, taken by themselves do not show any clear, precise and constant connection with the number of deaths. Of teluric influences, that of the rainfall, which plays so great a part in the etiology of the endemic and even in the epidemics of cholera and typhoid fever, do not in my opinion exercise so great an influence on the development of typhus, as can be seen by the little connection between the amount of rainfall and the increase of the disease.

There is no clear evidence that the poisonous miasmas which are absorbed principally from the ill-constructed sewers of the city, and which are chemically combined with the pathogenic germ of typhus, are the principal agent for its development, although that fact may unquestionably be presumed, as the disease has shown no special predilection to attack those persons who live in the lower quarters of the city, where the sub-soil consists of a thick layer of alluvial earth and even rubbish, whilst at the same time, it has attacked the persons who live in those streets which are entirely unprovided with sewers.

Neither can we trace its existence in an indisputable manner to the drinking water that is used in this city. Ever since the end of the year 1896 most of the residents of the city have ceased to drink water from the wells, most of which have dried up. They only used the water from a well 800 feet deep, chemically pure and free from bacteria, as well as from others situated outside of the city, and whose waters were not contaminated. Nevertheless, coincident with these circumstances, there was a slight exacerbation of the endemic which only terminated after energetic steps had been taken to put a stop to the circulation of paupers in the city.

Neither is there any evidence that occupation exercises any special influence on the disease, as it shows no predilection for any specific professional group. The same cannot be said as regards the social position of the persons attacked; and the exact data that I have been able to collect during the last three years, clearly shows that the poorer classes are those which furnish the greatest number of victims to this disease, amounting to 72 per cent. of the total number of cases. It has been found that this class furnishes the first victims whenever the disease reappears, or whenever it assumed a very bad form, and this is a circumstance that has never failed to appear. The first cases of typhus have never shown themselves in persons of comfortable circumstances, or who have the means to live with a certain degree of decency. The dwellings in the center of the city have never been among the first to present cases of typhus, which has always made its first appearance in the huts of the poor quarter. This fact has been perfectly well

established by my observation, during a period of six years, during which I have taken care to mark the houses on a map with pins as fast as cases of typhus appeared. There was another very clear piece of evidence that came to ratify my suspicion. On account of the great poverty, which resulted from the long drought and consequent failure of the crop, a group of charitable persons opened public soup kitchens in different parts of the city, where they fed the poor people twice a day.

The persons employed in this service were amongst the first victims of typhus, which later on invaded the entire city and developed into one of the most prolonged epidemics, lasting from October, 1892, to April, 1893, which has been seen in San Luis and the first in which the mortality could be ascertained with any precision. The impression produced on my mind, by the unfortunate consequences of the imprudent step, of opening these public soup kitchens, will be found more extensively explained in my article "On the influence of pauperism in the cities; its extinction as the best prophylactic measure against typhus."[1] Without in any way overlooking the cosmotelúric influences of the predisposing causes, I believe that this pauperism constitutes one of the principal etiological sources of typhus, giving to the masses the necessary receptive capacity which renders them susceptible to the attacks of the pathogenic agent, whether autogenic or transmitted; but undoubtedly they do not exercise any decisive influence on the development or spread of the disease, as neither the excesses of temperature or humidity or any other atmospheric agent in any way favor or disturb them in their origin or development.

It is true that the exacerbations of endemic cases have almost always taken place during the winter season, but in my opinion this does not proceed from the direct influence of the cold, but rather from the crowding of the people in the houses, and especially the crowding of poor people into small and badly ventilated rooms and the want of an open air life, such as they have during the other seasons.

Typhus is a disease whose specific character has been long known, but with regard to it our etiological and pathogenic information is as yet very incomplete. In my opinion this proceeds from the more or less want of uniformity of the scientific investigation which has been undertaken. We can hardly find any clinical type which is better known in the Mexican Republic than that of typhus; we have thousands of interesting observations published in all the scientific periodi-

[1] Paper read before and published by American Public Health Association in July, 1896.

cals of the country, and we have only to study these observations to satisfy ourselves that in this immense collection of facts we have all the elements for the study of the disease. If on the other hand, we inquire into the use that has been made of this enormous amount of material, we will find that, having omitted the principal operation (that is to say, that having been unable to rise above the mere facts, or to understand their relation), classification and application, so as to be able to understand the laws that govern them, have been impossible.

This task cannot be undertaken by any single worker, but must be the result of the co-operation of two groups of persons: one which will form a systematic plan to be distributed amongst a numerous staff, which would be formed of the second group, and would practically carry out the details of such a plan, by dividing itself into different sections, each of which would be under the charge of persons resident in the localities investigated, and who would be selected from amongst the persons who had previously shown a special aptitude for this kind of work. It would be desirable to establish a complete system of observations, on temperature, pulse, respiration, sanguinous pressure, etc., for each one of the symptoms of the disease, and the person in charge of these observations would summarize them in accordance with a formula agreed upon, and by the graphic system.

Persons making post-mortem examinations would execute them in accordance with certain rules and would report the results in a tabulated form, covering all the details necessary with regard to the organs they may examine.

The same methods would be followed by the person in charge of pathological anatomy. Those who may make an analysis of the blood of typhus patients would have to note down the number of red and white globules, of the hematoblasts, their relations to each other, the proportion of hemoglobin, the power of reduction, etc., and all this would be carefully noted on blank forms under the graphic system. These rules would also apply to the persons employed to analyze the secretions, and to those who made cultivations from the blood, the tumors or the organs.

The clinical characteristics of typhus in San Luis are as follows: Ataxic or adinamic form; evolution in fourteen days, very rarely in eleven or twenty-one, whilst the complications consist of congestion of the hepatic viscera, lungs or brain. The treatment that up to 1892 was employed by the greater part of the physicians in the city was essentially of a chronic character or sedative and anti-thermic. Since that time only slight variations have been introduced, principally consisting in the employment of disinfectants without neglecting the treatment referred to, but which now takes the second place.

Seeing that in typhus we have to deal, in my opinion, with a poisoning brought about by the product of microbes which are cultivated in some part of the system, either the mouth, the intestinal tube or in both, it is in that part that the infectious germ, as yet unknown, produces these toxic substances, whose absorption by the blood and afterwards by the nervous fibres gives rise to the general symptoms which are characteristic of that form of poisoning that we call typhus.

I believe that we ought to respect this culture in order to await the production of the antitoxin which must certainly be formed at a certain moment that up to the present we ignore, through the chemical-toxical action of the toxical product of the pathogenic agent.

For these reasons I consider indicated, the injections for washing the blood, consisting of an abundant artificial serum during the toxical period of the disease, and not during either that of the culture or of the production of the antitoxin.

DIPHTHERIA — SUGGESTIONS FOR ITS PREVENTION AND LIMITATION.

By CHARLES N. HEWITT, M. D., LL.D., Red Wing, Minnesota,

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At the request of the chairman I submit a "brief" of my experience as the head of a family, physician and as executive officer of a State Board of Health during a "running fight" of fifteen years with several hundred outbreaks of diphtheria.

The disease is always somewhere in a great State, is rarely absent in 100,000 people, whether in country or city, in fall, winter or spring.

Three classes of people must co-operate for continuous success. They are:

First. Physicians and health officers.

Second. Heads of families, especially mothers, who are the natural health officers of the home.

Third. Teachers in public and private schools, including Sunday schools; clergy and editors of newspapers.

There are three varieties of the disease with which they have to deal:

First. Without symptoms likely to attract attention.

Second. With slight sore throat and moderate malaise, not enough to induce any child to stay at home.

Third. The acute, disabling sort.

It is the fault of health officers and legislation that people think the control of infectious disease a peculiar "specialty," and say, when asked to help in enforcing the law: "We hire the health officer to do this; let him attend to his business, for which he is paid."

It is all wrong to expect the health officer to begin the fight and carry it to success by law alone, as wrong as to expect the minister who is paid, to save his congregation.

Without the hearty help of others the health officer cannot succeed.

I have never known a medical man who could, off hand and without experience, deal with a sharp endemic of diphtheria. He must have a sound professional training, settled into efficiency by some years of general practice. The best special training he can get is by three months' service with an experienced health officer who uses modern aids in library, laboratory, office and "in the field."

He must have practical business faculty, with abundant common sense, tact and patience.

The law should give him positive executive power, without the intervention of a board. If he is known to be competent, just and fearless, he will have little need of police or penalties. A well-equipped health officer is respected, carries confidence, and rarely needs to use force, though prepared to do so if he must. An incompetent is always blaming existing law, calling for more, and fails in proportion to the executive power given to him.

NOTIFICATION OF THE DISEASE.

The family physician blocks direct notice by families, and should therefore, recognize his responsibility, reporting suspects, and isolating them with the knowledge of the health officer, till a positive diagnosis shifts the duty to the official. Courteous tact in dealing with his professional brethren will save much trouble to the health officer and secure the co-operation of most of them.

A successful campaign against diphtheria, or any other infectious disease, depends more on the prompt discovery and control of "walking" cases than on any other one step, because they are the feeders for the infection, from child to child, where no danger is feared, or precautions taken, as on the street, in school, etc.

I beg to lay particular stress on this fact, with another (which I have proved in practice repeatedly), that if, during an outbreak, school teachers be required to report, after the last session, each day, all children (with names and street address) absent from school, or sent out during the day, the health officer will usually find among them the ones who are spreading the infection, and also its sources in persons and things. I have, more than once, won a fight against an endemic of two or three months duration and crushed it in three weeks by this aid from teachers, when physicians, public opinion, clergy and angry people could not assist so directly and efficiently.

As the first, and most, cases are young children, to find them is to trace other cases, isolate families and give to the sufferers opportunity for early treatment by their family physicians.

In this way all children, sick from any cause, are excluded from schools, and "suspects" kept off the street. The school is then the safest place for children, and the closing of schools becomes needless. It would increase spread of infection by unguarded association on streets, as elsewhere.

Infection comes oftenest in infected clothing (in dried mucus or membrane), and from centers of population to villages and country.

If the well children of a family are removed outside the house as

the first case occurs, our experience is that they are rarely attacked. Even after two or three days such removal has proved enough for their protection. I have seen many striking examples of this.

It is often a wise thing and an economical move to pay a workingman wages to stay home as a helper in the care of his children, rather than to permit him, a possible carrier of infection, to go to his ordinary labor.

WHEN IS A CONVALESCENT FREE FROM INFECTION?

I do not know, for ordinary evidence is fallacious, as is much called bacteriological. Children whose throats are well, and children whose throats have never been apparently affected, communicate the disease. The period of isolation after apparent recovery, which we fixed at one time as three weeks, was not enough in some cases, for the microbe (or one like it, which gave similar bacteriological evidence), was repeatedly found five and more weeks after apparent recovery. I am very sure that beside the various other microbes which accompany *b. diph.* that microbe varies exceedingly in malignancy and infectiousness at different stages of its growth and under varying conditions of culture in the bodies of its victims. I have found it fatal to guinea pigs when the child supplying it was apparently well.

DISINFECTION OF PERSONS AND THINGS

should begin immediately in the care of the patient by a thorough bath, clean bed clothes, bed and room. Bare floors and all furniture retained should be saturated with hot, boiled linseed oil, and after an hour wiped dry. This will make cleanliness easier and save much doubt and trouble afterwards. Nurse should wear a calico wrap, snug at wrists and neck, with a cap to cover her hair. Both to be removed on leaving room and put on when she goes back. They, with the clothing of patient and of the bed, must be removed every other day, at least, and put into very hot water before removal from the room. All discharges from mouth, nose, bladder and bowels put immediately into a vessel containing half pint fresh lime water. In an hour burn or bury. Floor swept daily with moist tea leaves or sawdust and furniture wiped with moist cloth. Put cloth with soiled clothes and burn sawdust. These easy measures, with all fresh air and sunlight possible, will bring case to a conclusion with least danger of auto-infection and least risk to others.

For disinfection of mouth and nose, for patient and nurse, nothing better than this mixture:

Forty per cent. sol. formaldehyde, ten drops.
Saturated sol. of boric acid, six ounces.
Boiled water, twelve ounces. Mix.

S.—Use as gargle or wash, and swallow some every time it is used.

DISINFECTION AND DISPOSAL OF THE DEAD OF DIPHTHERIA.

The writer has, in this Association, for several years urged the acceptance of the fact that, as a measure of public safety, the preservation of the body of the dead, as much as its disinfection, is the duty of the physician of the family or of the health officer. Both can be done in one short, easy and simple operation, without mutilation of the body, after which it can be transported in a common coffin and box without danger or offense, at any season and any distance.

All the misery which immediate burial, refusal to permit removal, and the outrageous bother and expense now insisted on when it is permitted, should be done away with as unnecessary and wrong.

For disinfection of room and contents which cannot be treated with boiling water, moist sulphur fumes have rarely failed me (and only with diphtheria), followed by scrubbing floor and furniture with hot soft soap suds, stripping off wall paper and whitewashing walls and ceiling with milk of lime as soon as slacked and while hot. Formaldehyde as vapor, or rather gas, have never tried, but its advantages in expedition, cleanliness, freedom from offense justify fair trial. Always insist on prolonged aeration and isolation of the room, and keep young children out of it as long as possible, for I have known several instances of a return of the disease in the first child occupant, after thorough and repeated disinfection, and in one case after six weeks of delay before occupancy.

Early diagnosis is very important, but not more so than to determine when the patient is no longer infectious. Therefore the discovery of the microbe and its associates by bacteriological methods should be at the immediate command of the physician and health officer. If the manufacturers would make a microscope without stand, and no larger than need be, with micrometer movement in barrel, and stage with the condenser, attached to the outer cylinder, so that one-twelfth immersion could be used, they would help us. Put it in as small and light a box as practicable for safety, with a vial of cedar oil, another of Crouch's stain, a few slides and cover glasses, and a few small tubes of a suitable culture medium. With these one can make a stain and examine at bedside, enabling diagnosis in eighty per cent. of cases. He can make a smear in a tube with a knitting needle, put the tube in his inside vest pocket and have a culture in twelve hours, or in less time. If he has no microscope or ability for so simple a job, he can send smeared glass or culture tube to some one who has. The plan here suggested is the result of trial, and physicians and health officers have no excuse, if they will undertake this work, for neglecting so important a part of it. There is no more

mystery or difficulty in this much bacteriological work, after a few lessons from one who is doing it, as a health officer, and the reading which belong to a knowledge of the service, than there is in a thorough performance of any other technical duty.

As to family and other co-operation, beside what has been stated as true of them, as of health officers, I have found no means so useful in an alarmed community as to visit it, make a thorough investigation, meet the physicians and then call a public meeting to consider the matter. Tell the story of the disease in general, what the facts now are, and the measures we propose to enforce; show why they are needed, ask co-operation, and tell how it can be best given; take the best view of the situation, cheer the discouraged, restrain the foolish and get to business as promptly and rapidly as possible. If the fight is tedious, keep the people in your confidence by frankness as to facts and as to what must bedone. In many trials of this plan I have never been sorry, and rarely failed to get the help wanted.

Diphtheria is the most fatal, insidious and persistent disease of its class; its infection persists in clothing, buildings and in the patient as none other I have met does, and so it escapes detection more easiiy than any other. We shall not be rid of it till another Jenner discovers its antidote, very likely like vaccine, a modification of its own virus.

REMARKS UPON SCARLET FEVER.

By A. WALTER SUITER, M. D., Herkimer, New York,
Member of Committee on Cause and Prevention of Infectious Diseases.

The variable character and almost infinite variety in *scarlatina* outbreaks have always been subjects worthy of consideration and comment.

There is perhaps no disease that epidemiologically presents such interesting and puzzling problems to the physician and sanitarian. This statement is fully substantiated by a study of its history during the two hundred years since it first became recognized and was described. The disease was originally confounded with *rubeola*, and was not differentiated therefrom until the latter part of the seventeenth century when the great Sydenham revolutionized the prevailing belief and established its isolation and identity as a distinct and separate form of exanthematous fever, with characteristics peculiarly its own. It was regarded in the beginning as a disease of mild and trivial nature, and in this respect it is common to quote the expression of Sydenham, which was destined by experience and observation so soon to be disproved: *Vix nomen morbi merebatur.*

After its specificity had been determined it was observed that epidemic outbreaks of varying severity appeared both in Europe and America, and its strange peculiarities as such were especially noted and studied. Outbreaks were in some instances (and have been to this date) of such mild manifestation and slight mortality, although widespread as to prevalence, as to gain title to be called *benign;* others were attended by such extraordinary mortality that they were termed *malignant,* while others still were irregular—manifesting benignancy in one infected area with malignancy in one adjoining. So far as known the invasion of this continent by the disease was begun in the year 1735 in the United States. Its spread was comparatively slow, but its severity increased to the extent that it is now universally regarded as the most treacherous and intractable as well as the most fatal of all the exanthematous fevers.

It is not intended that this report shall make detailed reference to the peculiar phases in the epidemiology or the symptomatology of scarlatina. These historical references are introduced simply for the purpose of directing the channel of thought towards the principal object of this investigation, viz: the study of practical measures of prevention.

The prophylactic control and restriction of this disease probably presents more mooted and difficult questions than that of any of the other communicable diseases, or perhaps all combined. The *sub judice* condition of our knowledge concerning the specific contagious element places in a certain sense the stamp of empiricism upon our efforts at prevention, but observation, the application of well-known principles of science and experimental experience have taught that it is entirely within the power of properly directed and thoroughly executed sanitary management to practically limit and satisfactorily control the epidemic influence, however mild or severe may be its potency.

It may be assumed that the following propositions have been universally accepted and established:

That it is a disease of childhood in a general sense; that it does not appear *de novo;* that it is transmitted by and through the human body; that it is infective in the highest degree and persistently so as the infectious element is capable of reproduction after many months and even years under favorable conditions; that it may be conveyed by attachment to fomites of every description and in the most indirect manner (instances to illustrate which might be multiplied),; that the virus does not readily become dissipated, volatilized, diluted or attenuated in such manner as to become innocuous; that it is capable of resisting all ordinary physical atmospheric changes, even when conveyed through variable climates; that individual susceptibility to the contagion cannot be modified by any known artificial means or by any conditions of life, but the mortality rate is very largely influenced by conditions of poverty with its deprivations, or wealth and its opportunities for efficient care and proper sanitary application; that one attack furnishes immunity almost invariably; that the infective element in all probability escapes from the body by the medium of the desquamative products which are detached from the skin and membranes during the progress of the disease, and thus may contaminate the air, and be absorbed therefrom by drinking-water or milk; that satisfactory proof is still wanting of the micro-organic character of the contagium, although many facts and experimental studies point in that direction; that a very curious and interesting relation seems to exist between certain disorders of milk cattle and scarlatina, but the exact nature of the relationship has not been conclusively established, and the same may be said of the supposed biologic identity of the streptococcus infections which are theoretically made to include scarlatina because of its suppurative complications and sequels (the treatment of the disease by means of anti-streptococcic serum is the outgrowth of the latter theory, but conclusive results are wanting). That the scarlatinal poison seems to be capable in some manner of exciting germinative activity in patho-

genic micro-organisms which may have found lodgment in diverse situations in the body, thus producing complications and sequelæ (e. g., the streptococcus pyogenes, bacillus diphtheriæ, etc.), is quite beyond question and may serve to explain much that has been said concerning the relation of scarlatina with the infections of pyæmia, erysipelas, etc. No definite rule can be stated as to the period of time during which this disease may be considered contagious. Individual circumstances must always determine. Excepting the cases where complications prolong the danger of communication the period of from four to six weeks is generally accepted.

With these desultorily stated facts and references in view, we come now to consider circumstances connected with the special inquiry of the committee, viz: The relation of "natural soils, water, excreta, refuse and sewage, houses, camps, ships, railway cars and direct contagion to outbreaks, together with practical measures for preventing the dissemination of the disease" under the conditions noted.

Scarlatina is not *naturally* an air-borne, a soil-borne or a water-borne disease. Beyond the strong probability that outbreaks may be greatly modified as to character and severity by the condition of the sub-soil, organic contamination of water and in a general sense unsanitary surroundings, there is no cogent reason for believing that when any or all of these circumstances are associated the relation is causative.

Imperfect disposal of refuse and excreta bears no such relation.

Unquestionably direct contagion by personal intercourse is the greatest agent in the production and spread of epidemic outbreaks.

Accidental contamination of water, milk, food, houses, camps, railway cars, etc., all point to personal intercourse as the prime etiological factor.

In this consideration the paramount importance of the means for combating the epidemic influence, viz: *The prompt, complete and rigid separation of the infected from the uninfected during the entire period of infective danger, and the thorough disinfection of every person or thing that may chance by any possibility to convey the poison,* is readily suggested.

As a matter of fact there is no disease the outbreaks of which can be more certainly placed under restriction and control than the one under consideration, providing the means to that end are effectually applied. The burden therefore of this report must be an earnest plea for the perfect and efficient application of the well-known and universally accepted measures for the accomplishment of the object sought.

A priori this appears to be simple enough to be eminently practical, but experience has taught that great and sometimes almost insur-

mountable obstacles stand in the way of the proper execution of the necessary details.

The state, municipality, the personal attendants and the afflicted people themselves must all co-operate in the most determined and intelligent manner in order that official direction, now quite generally promulgated even to the utmost degree of particularity, shall be faithfully carried out.

Mention should here be made of the often proposed isolation hospital system of management of epidemics of this disease in place of the quarantine system now in vogue. Such a scheme if acceptably ordered would doubtless prove an effectual factor towards restriction in cases where the conditions are such that home isolation and disinfection cannot be properly enforced.

We do not undertake, as it seems entirely unnecessary, to enter into detail in the matter of methods of disinfection. Steam and formaldehyde at the present time hold first place, and the means for their efficient application are considered and discussed as separate departments of inquiry by this Association.

We have only and finally to declare that the failure to totally eradicate scarlatina from the list of communicable diseases is not the fault of the principles of modern sanitary science, but to insist that it depends entirely upon the *effectual execution* of the same.

WHAT CONSTITUTES AN EPIDEMIC?

By BENJAMIN LEE, M. D.,

Secretary of the State Board of Health of Pennsylvania, Health Officer of the City of Philadelphia.

"What constitutes an epidemic?" The reply to this question will be, or should be, entirely different, according as it is made by the philologist and lexicographer or by the sanitarian, and more especially the sanitary official.

The former will tell us that, inasmuch as the word is composed of the two Greek words, *epi*, upon, and *demos*, the people, it must mean something which befalls an entire people, the whole population. Taking "Worcester's" as a representative general dictionary we have the following definition:

"Epidemic—A disease which attacks many persons at the same time."

Consulting "Gould's" as the latest and one of the most reliable medical dictionaries, we find it stated that "an epidemic is a disease affecting a great many individuals in rapid succession, but due to some agency that has been brought from afar and not generated in the locality."

Observe that in this latter definition a new element is introduced, that of rapidity of spread. The medical profession has usually been inclined to adopt the former interpretation and to demand the existence of a large number of cases of a given disease before being willing to allow that the same is prevailing epidemically. Sanitarians, being for the most part physicians, have been inclined to coincide with this view.

In order to arrive at some precision and definiteness in the use of the term, the effort has been made to determine just what proportion of any given population should be attacked in order to justify the declaration that an epidemic exists. As a specimen of such attempts may be cited a report of a committee of the Medical and Surgical Association of New Orleans, in response to the query: "Under what circumstances is it proper to declare such diseases (diphtheria, scarlet fever, measles, small-pox, yellow fever, etc.), epidemic in a place? The answer given was that the disease should be declared epidemic when the number of cases should reach these proportions:

For a population of 100—5 per cent.
For a population of 500—4 per cent.
For a population of 2,000 to 5,000—22 per thousand.

For a population of 6,000 to 10,000—16 per thousand.
For a population of 20,000 to 50,000—8 per ten thousand.
For a population of 50,000 to 100,000—4 per ten thousand.
For a population of 200,000—1 per ten thousand.

The somewhat startling declaration of the Board of Health of New Orleans in reviewing the history of the presence and progress of yellow fever in that city a year ago, that the number of cases had at no time reached the proportions of an epidemic, was undoubtedly based on this hard and fast arithmetical standard. We were deprived of the presence, at the meeting of this body, of the representatives, not only from New Orleans, but from all the Gulf States, whom we usually greet with so much pleasure. New Orleans was quarantined by all her sister cities at the South. Travel and traffic were almost suspended. Shotgun quarantine, established at many points, rendered locomotion a matter of considerable risk. The mental equipoise of a distinguished United States congressman was greatly disturbed by the arrest of his progress at the muzzle of a musket, or something equally unpleasant and suggestive. All the resources of both national and state sanitary authority were drawn upon to stay the pestilence. Bulletins from the afflicted cities were looked for all over the North with feverish anxiety. The commercial relations of the whole country were thrown out of gear, and yet "the proportions of an epidemic were at no time reached."

I think it was Machiavelli who uttered the famous aphorism, "Words are the counters of wise men, the coin of fools."

Another equally distinguished European liar—I beg pardon; I should have said "diplomat"—has informed the world that the object of language is to "conceal ideas." Is the word epidemic a "coin" or a "counter"? Is it to be possessed of a definite meaning and to be used to convey an idea, or is it to be juggled with for the purpose of concealing an idea? Practically, as employed at the present time, it is simply used to describe the presence of a communicable disease in another fellow's town.

Inasmuch as the reluctance of the resident physicians and more especially of the authorities of a town, to acknowledge the existence of an epidemic is founded upon a purely commercial basis, having no other motive than the fear of the diminution of trade, while the readiness of the neighboring town to proclaim it is based upon a wholesome instinctive aversion to contracting the supposed infection, is it not reasonable that the view of the latter, rather than of the former, should be adopted as that of the sanitarian? In other words, should not rapidity of spread, rather than the number of cases, be recognized as the true test? A child is as much a human being at the

age of one year as is the centenarian, and counts for as much in the census. In tracing the history of the most extended epidemics, we generally succeed, if we possess sufficient patience and acumen, in getting down to the first case. Now, while the presence of a single case would not justify the declaration that an epidemic of a contagious disease was prevailing, yet if half a dozen other cases should appear in rapid succession, all traceable to the first, directly or indirectly, I conceive that the sanitary authorities would not only be justified in giving the public knowledge of the existence of the cases and of the locality in which they were found, and moreover in stating, officially, that the disease was present in epidemic form, but it would be their bounden duty so to do, and not only that, but to notify the authorities of neighboring towns of the fact. Sanitarians are watchmen, and it is the duty of watchmen to give the alarm. No more ridiculous bug-a-boo was ever set up by physicians and officials than the fear of creating an alarm or panic. Alarm and panic do not kill people in large numbers, any more than homesickness kills our soldiers, the assertion of a distinguished would-be medical scientist who occupies a high place in the councils of the United States, to the contrary notwithstanding. Panic does not attack the city whose people have been kept informed of the actual progress of an epidemic from day to day, and of the means taken to suppress it, but rather the population which suddenly awakes to the realization of the fact that it has been purposely hoodwinked and that, apparently, suddenly a pestilence has broken forth in all its borders. Then it is that terror holds high carnival and men become wild beasts in their mad rage to escape. When a police department of a city is notified of the existence of a fire, it does not make it its duty to conceal the fact, but, instantly, with loud alarum and clang of bells, despatches its engines and firemen to the designated spot, well knowing that the tiniest flame may be the beginning of the most disastrous conflagration. Should not this be also the policy of those whom the city has appointed to stay and check the progress of conflagrations among its people far more terrible than those which merely consume warehouses or even habitations?

My contention is that the actual number of cases of a contagious disease in proportion to the population as a criterion for the declaration of an epidemic " has nothing to do with the case" any more than "the flowers that bloom in the spring," but that rapidity of spread should be solely considered. The board of health which, having knowledge of such condition, purposely conceals it, or still worse, denies it, is guilty of a crime of hideous proportions, none the less so because it is acting in obedience to the behests of the business portion of the community or from a mistaken sense of local patriotism.

THE URGENT NEED OF SANITARY EDUCATION IN THE PUBLIC SCHOOLS.

By MRS. ELLEN H. RICHARDS,

Institute of Technology, Boston, Massachusetts.

If any one lesson stands out more prominently than another as taught by the experience in the recent war with Spain, it is that the average American citizen has not accepted the teaching of sanitary science as a part of his creed. Since it has been made so painfully evident that the diffusion of knowledge through the public print and by lectures and conventions has failed to reach the people, the remedy for this ignorance is to be found in securing the correct teaching of the elements of public hygiene in the public schools of the country. By this means alone will the entire population be reached and the habits which make for health be inculcated while the mind is plastic enough to receive and retain a new idea.

At this time, when every state in the Union is suffering the loss of men from preventable disease and is paying larger sums of money for the care of the sick soldiers than was paid for the support of the fighting men, there is a good opportunity to preach the gospel of preventive medicine.

A first essential for the teaching of the elements of sanitary science in the public schools is a school house in which every principle given is *not* illustrated by a *violation* of said teaching.

Why should our soldiers have believed that it made any difference what water they drank when they had been accustomed to the conditions prevalent in nine-tenths of the school yards in this country?

Why should the men on the transports have taken pains to keep the deck clean when they have been accustomed to dirty school-room floors, dirty school yards and streets littered with rubbish all their lives?

It was the ignorance and unbelief of the *men* which made the task of those officers, who knew, so hard, and we must assume that ignorance and unbelief existed even among the officers, else such a state of things could not have existed as has stamped the country with a brand of disgrace which it will take years to wear off.

Clean school houses, clean streets and special education cost money which municipal officials claim it is impossible to get, but the fact should be brought home to the community that the cost of needless

sickness and death among our soldiers would have paid for the cleaning of every school house in the land, and the amount of the pension money will be more than sufficient to keep them clean.

Is it not, then, a patriotic duty for this Association to urge the matter of public school education and to appoint a committee to prepare a small primer, which shall contain the essential principles of preventive medicine which can be as universally taught as is first aid to the injured? That there is need of this spur to public opinion is shown by the following extract from the report of the meeting of the Boston School Board, August 20, 1898:

"Regarding improved heating, etc., in the —— school district, the committee reported that the work, in view of the limited appropriations, should be deferred for the present.

"Dr. —— hoped that this would not be voted. He stated that in the ——street school house, in that district, the sanitary condition is deplorable. 'The plumbing of one of the sinks,' he went on to say, 'was disconnected last winter, and the pipe has remained open up to the present time. The closets are directly under one of the school rooms, and the foul odors come into the rooms. A teacher has been advised by her physician not to go there this fall on the opening of the school unless something is done to remedy this evil.'

"Dr. —— asked that at least $25 be appropriated to connect that plumbing. 'A peppermint test,' he said, 'has been made, showing that sewer gases have free access to the basement where the children play.' This condition he characterized as an outrage.

"Mr. —— stated that if the matter was left to the committee it would do all possible to connect the plumbing. 'We cannot do things without money,' he said, 'and we have to pick out those things that are absolutely necessary. We know that the plumbing in many of the school houses is not what it should be. Bills left over from last year have to be paid, and we have only money enough to keep the school houses wind and water tight.'

"The report was accepted and the recommendation that the work be deferred was adopted."

Among the questions issued each year to the health officers of the towns should be found those calling attention to the condition of school buildings and the need of public education in sanitary matters.

The volunteer soldier's ignorance of food values and food preparation was even greater than his ignorance of the most evident of sanitary principles.

Good cooking would have undoubtedly postponed, if not prevented, the outbreak of fever. It is evident that the state troops should have instruction in camp cooking as an important feature of the annual

encampment. It is also evident that the luxurious habits of Americans in general have weakened their stomachs, so that much time and out-of-door life are required before they can digest the wholesome army ration, even when of good quality. The examination for the army should include the digestive capacity, for the man with dainty appetite has no more place in the army than the man with a bicycle heart. Whether the reported statement of one of the Rough Riders is literally true or not, it conveys the truth we should emphasize.

"The reason Roosevelt has not lost flesh is his great eating capacity. He can eat anything, and lots of it. When there was only hardtack and bacon, he ate hardtack and bacon as if that was just what he had been hungry for for a month. That's the reason he was not laid up with the fever."

The duty and responsibility of the healthy man for his own and other's health is, just now, to see that all school children are taught to prepare and relish the simple wholesome food which alone can give a sound body.

THEATRE SANITATION.

By WM. PAUL GERHARD, C. E., of New York City,
Consulting Engineer for Sanitary Works.

The Honorable President of our Association has invited me to prepare a paper for its annual meeting, and seeing that the Executive Committee has placed among the topics for consideration "Sanitation, with special reference to Drainage, Plumbing and Ventilation of Public Buildings," I have selected as my subject "The Hygiene of Theatres," not so much with a view of presenting any new facts or startling theories, as with a view of eliciting discussion upon a question of sanitation which has been hitherto somewhat neglected.

One reason for this apparent neglect is undoubtedly the fact that, though large numbers of persons are congregated in theatres, halls and other places of amusement, the duration of stay in such buildings is a brief one, never exceeding three or four hours at the most, whereas in other public buildings, such as schools, court houses, assembly halls and lecture halls, occupancy generally extends during the whole or a large part of each day. I venture to assert, however, that going to see a play would be a far greater pleasure if theatres were adequately ventilated and otherwise kept in a sanitary condition.

My intention originally was to base the statements of this paper upon a careful, detailed personal examination of existing theatre buildings, but pressure of business and the limited time afforded me for the preparation of this paper, prevented me from making such special studies and inspections, and I am therefore obliged to draw largely from casual experiences and observations taken while visiting both parts (*i. e.*, before and behind the curtain), of a number of theatres.

Arrangements for the comfort and health of theatre-goers, of actors and stage employés are seldom considered, except in the rare instances of a few recent metropolitan theatres. Leaving these out of consideration, it is no exaggeration to state that most theatres are ill-ventilated and badly drained; that the arrangement of their toilet-rooms is unsanitary and ill-planned; that the plumbing is defective, the water-closet accommodation inadequate, the dressing rooms overcrowded and without any provision for comfort and fresh air, and that the general state of cleanliness of the building is very far from being satisfactory.

It is a well-known fact that there are vast numbers of persons who, while they would thoroughly enjoy a good play, are restrained from

visiting such places of amusement, for the very good reason that they fear the exposure to the stifling, noxious, over-heated atmosphere of the buildings, and who are sure, if they do go, to awake the next morning with a severe headache or with a cold or sore throat contracted through exposure to draughts. If this is true of the theatre-goers, how much more must the performers and stage hands suffer, who are obliged to remain in the building not only during the performance, but also for rehearsals, and for the countless preparations incidental to the staging of a new play. The general state of health of performers must suffer and they are often subject to throat troubles or other ailments.

The arrangement of the stage dressing rooms is at times frightful beyond description. Often they are located below the level of the stage in narrow, dark underground passages, without outside window or any other means of ventilation. Their size is reduced to a minimum and they are generally overcrowded. In many instances the theatre architect has done his best to provide suitable dressing rooms for a small company, and the place is subsequently changed to one devoted to comic opera or spectacular entertainments, requiring a large number of performers. To accommodate these the dressing rooms are partitioned off, or dark underground places are selected for additional rooms. Then again we find the water-closet accommodations, both for the public and for the actors and theatre employés, insufficient and always more or less antiquated, worn out and defective, or with an insufficient water supply and flush. In many places their location and state of untidiness suggest the greatest disregard for decency and moral feeling.

One of the usual defects has reference to the site or location of a theatre, for the site frequently decides the location of the places from where the fresh air for the audience is taken. Many of the older theatres are located in the middle of a city block, with only one side fronting on the street. At the back or side of the building there is often a small, dark, ill-aired court, obstructed by rubbish and accumulation of disused stage scenery, and which is frequently used as the only available urinal accommodation for the stage hands. How can it be possible to provide suitable inlets for fresh air for the audience in such courts where the air must be of necessity foul? Quite often odors from neighboring restaurant kitchens or from stables, extend to this court, and rush up to the stage whenever a door is opened. Therefore, the isolation of the building, at least on three sides, is very desirable, not only for safety's sake, but to provide efficient ventilation.

In the understage we often find other sources for bad odors, such as defective or leaky sewer pipes, untrapped floor cesspools and abominable panclosets. The contaminated air will naturally rise to the stage, and rush into the auditorium whenever the curtain rises, or when the orchestra exit door to the understage is opened for a moment. I know of at least one theatre in Greater New York where each time the curtain rises a strong whiff of sewer air greets the audience.

The plan of a theatre building often is of necessity such that the auditorium has few, if any, windows to the outer air, which could be used for air-flushing when the house is not occupied. As a result of the shortcomings just mentioned, theatre audiences are obliged to breathe for several hours in succession a noxious compound of the products of combustion due to gas illumination, and of the respiration and perspiration of hundreds of people, some of them doubtless in need of a thorough washing, while many are clothed in ill-smelling and dirty underclothes.

During a performance the atmosphere thus becomes stuffy and oppressive beyond description. It is stated upon good authority that chemical analyses show the air in the dress circle and gallery of many a theatre to be in the evening more foul than the air of street sewers.

Behind the curtain, the worst forms of unsanitary conditions often exist. The stage floor is full of dust, which is but rarely thoroughly swept, and becomes stirred up by the constant shifting of scenery, by the rolling up of stage carpets, by the moving of furniture and set pieces, by the dancing, etc. In the auditorium the carpets, upholstery of the seats, and the box decorations and hangings become saturated with the vile odors, possibly causing sore throats to persons in the audience susceptible to such ailments. Plush seats and floor carpets of public places are harbingers of dust and disease germs, such as those of tuberculosis.

The wonder is that the public will not abstain from going to theatres the sanitary conditions of which are notoriously and grossly bad. If they were to do this it would set managers thinking, and reforms in the matter of theatre sanitation would soon be begun, in the same way as improvements in the safety of such places of amusement were, to some extent, impelled by the fact that after a theatre fire disaster, the public kept away from buildings known to be unsafe or even veritable deathtraps.

Having briefly alluded to some of the usual defects, I will now speak of the hygienic requirements of theatres and suggest some remedies which would render such buildings sanitary and comfortable

and would enable theatre-goers to derive a few hours of real enjoyment and to thoroughly appreciate a play.

I am convinced of the fact that sanitary reforms will in the future be accomplished if only the public will demand them.

I. DRAINAGE.

In arranging for the drainage and sewerage of a theatre building the general rules as to size and material for the sewer lines, the grade to be given, the manner of making proper pipe joints, etc., should be followed. As a rule, the area covered by a theatre building is so large as to require at least two six-inch sewer connections. Proper attention should be paid to proportioning the sizes of the rainwater conductors which drain the roof surfaces over the stage and the auditorium, which latter are at times very extensive.

All areas and courts should be properly paved, pitched, graded and drained. A difficulty in the way of drainage often arises from the considerable depth to which that portion of the stage house, known as the "understage," has to be carried. Owing to the requirements of stage traps and stage machinery, the level of the understage is frequently located below the level of the sewer in the street. Any subsoil water accumulating in the sump, must be removed by lifting same by means of either automatic cellar drainers, worked by water pressure, or by means of steam ejectors, or finally by electric centrifugal pumps. Often the entire subcellar is constructed perfectly watertight, like the cellar of a warehouse situated below tide or subsoil water level. This not only keeps out the subsoil water, and prevents dampness, which is undesirable for the stage house, as it would tend to ruin the stage flooring, the stage properties and the actors' and supers' costumes, but it also prevents a pollution of the air by ground air, and tends to keep the air of the stage pure and wholesome.

II. PLUMBING.

I do not exaggerate when I state that there are but very few theatres which have the plumbing properly arranged. Of course, we find in recently-built theatres, of cities where plumbing rules and regulations are enforced, that the soil pipes and waste lines are carried full size up to the roof, and the fixtures are separately trapped. Generally, however, the plumbing is of the plainest kind, and without any attempt at elaboration. On the other hand, the plumbing of theatres and "opera houses" in smaller towns and villages exhibits often the worst defects imaginable, the entire work being carried out in a slipshod manner, the water-closets of dressing rooms being generally set on "dead ends" of drain lines, having no soil pipe extension to the

roof and often being a part of the dressing rooms, partitioned off only by thin board partitions. Basins and sinks are often in direct connection with the sewer, traps being considered a superfluous and altogether too expensive refinement for such a building. In dark corners disused closets or sinks are at times discovered. Drains are laid in a haphazard manner, often sloping the wrong way. Tile drains and cement pipes are used where extra heavy cast-iron sewer pipes should be run; all manner of faulty joints are discovered, and in many cases the sewage drips on to the floor, and becomes the cause of the annoying odors which so often greet the audience when the curtain rises. Pan closets and ill-flushed hopper closets are used, and the apartments in which they are arranged are found to be in an indescribably filthy condition. This being the case, is it surprising that we should find even in some of our larger cities, an advertisement printed on the theatre programmes, stating that "the 'Ne Plus Ultra' or other well-known disinfectant is used in this theatre?"

It goes without saying that the plumbing of theatres should be planned and arranged with the same care as that of other public buildings. There should be toilet rooms for each tier in the auditorium, entirely separate retiring-rooms being provided for men and women. Sufficient accommodations should be provided in that part of the stage house, which contains the dressing rooms, for actors and actresses. In addition there should be in the basement well-arranged and ventilated toilet rooms for the stage hands, employés and the supers. The office of the theatre manager often has a separate toilet room, and there is, in larger houses, a toilet room adjoining the star's dressing room. Near the engine and pump room a toilet room for the engineer and his help should be provided, and if there is in the front part of the house a smoking room or refreshment room, a men's toilet room with urinals and lavatories should be provided.

Handsome nickel-plated work and fittings do not seem called for in a theatre, except possibly in the toilet rooms of the parquet and dress circle, or for the occupiers of the boxes in large opera houses, but nevertheless the entire arrangement should be in every way sanitary and the best workmanship is required. Woodwork should be avoided for well-known reasons. The floors and walls should be rendered waterproof and non-absorbent, partitions between water-closets and urinal stalls should consist of marble, slate or soapstone. Every toilet room should have a window to the outer air, and in addition artificial ventilation by exhaust flues should be provided.

The closets should be of glazed earthen or vitreous ware which will not craze. The type known as "washdown" closet is particularly adapted for a theatre, and the flush for same should always come from

a special copper-lined flushing cistern with pull-flush, though an automatic seat flush may often be preferable, owing to the careless manner in which the public, as well as stage hands, use such places.

For the same reason it may be preferable to have porcelain urinal bowls with self-acting intermittent flush tanks. In theatres in which spectacular plays or ballets are performed, requiring a large number of female supers and dancers, self-flushing urinettes or pedestal urinals for women may with advantage be provided, as the same require for connection to the sewer a two-inch waste line, whereas the water-closet, ordinarily used by women as a urinal, requires a four-inch soil pipe.

All stage dressing rooms should be fitted up with small corner or wall lavatories, which must have both hot and cold water faucets, and each of which should be safely trapped, while the waste line should be extended to the roof for ventilation.

I have on different occasions pointed out the sanitary advantages of bathing facilities, in general, and of the modern rainbath in particular. I trust I may be in accord with the views of sanitary advisers when I suggest that there should be in every theatre one or more douche or rainbaths for the use of actors and of the stage employés. A simple, inexpensive waterproof stall of Alberene stone, or of slate, could be fitted up with a mixing valve for hot and cold water and an overhead inclined douche. This would not occupy much space nor would it cost much to run because hot water is usually available. I am sure it would be well patronized after the close of the performance.

There should be a few slopsinks, both near the stage and in the public toilet rooms, as they are required by the women scrubbing the floors, for the emptying of wash water, and to draw clean water.

The general principles of sanitary house drainage apply with full force to the plumbing of theatres, and inasmuch as I have frequently discussed and described the latter in various books and pamphlets which are readily accessible, and because there is nothing new to be said, the subject must be dismissed with these few words.

III. WATER SUPPLY.

Theatre buildings require a very ample and large supply of water. There should be, in each theatre, two entirely distinct systems of supply, one of which serves the purpose of fire protection, while the second system provides water for the plumbing fixtures, for flushing, washing, and general cleanliness.

The water supply for fire-extinguishing purposes embraces large suction tanks in the basement, roof tanks, to supply the automatic sprinkler system, a powerful fire-pump in the engine room supplying

the fire standpipes and fire valves, etc. This system has been elaborately described by the author in his book on "Theatre Fires and Panics," to which those interested are referred for further details.

The house supply, as stated, should be entirely separate, and where the street pressure is insufficient to supply the plumbing fixtures in the upper parts of the theatre, special house tanks should be provided on the roof over the stage. It will readily be seen that it would be inadvisable to use the sprinkler tank for such purpose, as it might be found empty just when wanted. The rules of the National Board of Fire Underwriters wisely specify that no branch for sinks or for drawing water for any purpose whatsoever should be taken from the sprinkler tanks.

Sometimes house tanks placed above the highest plumbing fixtures, for instance on one of the upper flies or in the rigging loft, fill at night by pressure from the street mains; in the majority of cases, however, it is necessary to pump the water to the tank, which is accomplished by means of direct-acting steam-pumps, or by electric pumps, or hot-air engines, or even windmills placed on the roof.

The house water service comprises further a hot water tank, for the players and supers require in their dressing rooms hot water in abundance at the basins and washsinks to remove the face paint, etc. Hot water is likewise required at the slopsinks for the use of the scrub-women.

Regarding service pipes, their material and arrangement, shutoffs on the lines and their branches, the water service system does not differ essentially from that installed in other public buildings. Where drinking water is provided on the stage, and in the corridors outside of the dressings rooms, filters may be required, likewise water coolers. These do not present any special feature worth mentioning.

IV. VENTILATION.

I come now to a very important requirement of theatre buildings, namely that of ventilation. I have already made allusion in my introductory remarks to the almost universal lack of sufficient ventilation in theatres, which causes the restlessness, languor and drowsiness of theatre audiences, and I have pointed out, that a wise and thoughtful theatre manager will, in order to insure a "full house," use all possible means and care to have his house well ventilated, for nothing contributes more to the enjoyment of an audience than pure air, and in the future those theatres will be patronized by the public by preference, which are as safe as they can be made from the danger of fire and panic, and which also have an efficient system of ventilation.

It is impossible, in a paper such as this, to discuss in detail, the various systems and methods of theatre ventilation.

When new theatre buildings are to be erected architects should always associate with them an expert in heating and ventilation, two problems which always go together. I must content myself with pointing out, that it is necessary that every part of a theatre should be ventilated, not only the auditorium, but likewise the stage, the dressing rooms, the understage, the engine room, the vault where the gas meters stand, and finally, the numerous toilet and retiring rooms in both parts of a theatre.

The amount of ventilation to be provided varies with, and depends largely upon, such factors as the mode of lighting employed, whether by candles, by oil lamps, by gas lights, or by electric light; upon the size of the building and in particular the number of people which can be seated in the entire auditorium; and also upon the general state of cleanliness of the building, to which I shall refer again hereafter. Doubtless, the introduction of electric lighting in theatres has contributed more than any other agent to render this vexed problem a good deal easier to solve.

In designing a system of ventilation for a theatre it should be borne in mind that ventilation means not merely the removal of foul air, but simultaneously the introduction of a sufficient quantity of pure air, drawn from a suitable source out-of-doors, suitably filtered and warmed in winter time, suitably sprayed or cooled with ice in summer time, and introduced at all times without any unpleasant air currents or draughts.

It is manifestly insufficient, then, to merely provide in the auditorium, a few outlet flues and ventilating registers of restricted size for the removal of foul air, and to rely upon fresh air being drawn in through accidental openings, or cracks or crevices, or from the level of the stage. In all cases, both inlet and outlet flues of generous size should be arranged, and care should be taken that the same are in no way obstructed. There should be a supply of fresh air to each and every person in the audience, equal to at least 30 cubic feet per minute, or 1800 cubic feet per hour. General Morin, in his well-known treatise on ventilation, suggests a supply of 1200-1500 cubic feet per person per hour. In a theatre of medium size, seating 1000 persons, the former allowance means an hourly supply of pure air of 1,800,000 cubic feet, and it will be obvious that it is not quite an easy problem to introduce such vast volumes of air, particularly when introduced near the floor level, without causing air currents which may be unpleasantly felt by the theater-goers. To warm this quantity of air in winter time, when the thermometer out-doors stands near the zero

point, to 68 degrees, likewise means a good deal of expense for coal to the theatre manager. The system must therefore be carefully laid out and calculated to secure results which will be satisfactory to all concerned.

It is obvious, furthermore, that to introduce and to distribute evenly such large volumes in all parts of the audience hall, forced or mechanical ventilation, by means of fans or blowers, will be required. In the *plenum* system of ventilation, draughts are avoided by forcing the pure warmed air into the auditorium under a slight pressure.

The fresh air may be introduced at the top of the house, through the ceiling, and made to move downwards in a steady and uniform current, until it reaches the lungs of the spectators and then removed at or near the floor line, or else, air may be introduced at or near the bottom, and exhausted at the ceiling, of the hall. Much has been written about these two systems of *downward* and *upward* ventilation, and arguments in favor of both systems may be found in any good text-book on ventilation. To a certain extent, either one of the systems may be successfully planned and arranged; the plan and subdivision of the theatre building, the details of construction, and local conditions will generally decide the question. Where a theatre is lighted with electric lights, the downward system of ventilation will show better results than where gaslights are used.

A good system of ventilation should effect a complete change of air three or four times an hour, and this change of air is required, not only in the auditorium, but also for the foyers, the stage, the dressing rooms and toilets.

It is a fact that good ventilation improves the acoustic properties of a theatre. On the other hand, the question of ventilation should always be treated in connection with the question of safety from fire. To depend, for example, for the ventilation of the stage upon a strong current of air from the stage into the auditorium, would be a grave mistake. For, with such an arrangement, in case of a fire on the stage—and it is proven by statistics that the majority of theatre fires have their origin on the stage—the smoke from the burning scene decorations, etc., would be drawn into the upper part of the auditorium and would suffocate numberless persons in the gallery before they could make their escape from the burning building. On the contrary, it would appear to me to be the aim to create, in such cases, a strong current from the auditorium in the direction towards the stage. Doubtless, this can be efficiently accomplished, and one way of doing it is to provide large ventilators in the roof over the stage. With the stage cut off from the auditorium by a fireproof or fire-resisting curtain, of asbestos cloth, for instance, the audience would

have plenty of time to escape unhurt, and repetitions of fire catastrophes, such as those of the Ring-Theatre in Vienna, and of Nizza, would become impossible.

Leaving, however, aside the question of fire, it seems but reasonable to require that the stage should have at all times thorough ventilation. The fumes incident to colored fires, the smoke due to burnt gun powder, slight gas leaks and other stage odors should never be allowed to penetrate the auditorium. Whoever has been an eye-witness to the endless coughing or sneezing of the audience after such a battle scene, as that presented recently at the New York Academy of Music in the play of "Shenandoah," will agree to my proposition that separate stage ventilation is extremely desirable.

There should be adequate actors' dressing room accommodations, and these likewise require to be efficiently ventilated, preferably by windows to the outer air, or by special vent shafts, where windows are out of the question. Finally, all toilet rooms require a constant change of air, and an abundant supply of fresh air to keep them sweet and wholesome. Special stress should be laid upon the necessity of arranging for a current of air from the halls into the toilet rooms, and not vice versa, for otherwise, however good the system of ventilation may work, unpleasant odors from the water-closets and urinals will penetrate other parts of the theatre.

The boiler and engine rooms should also have plenty of fresh air, and all building regulations provide that the vaults, where gas meters are set, must have suitable ventilation, to prevent explosions of gas.

V. LIGHTING.

In the matter of lighting, I have already pointed out that with the advent of the incandescent electric lights a new era in theatre sanitation has begun. Possibly some of those present here may remember the primitive methods in vogue years ago of lighting up the stage and auditorium of a theatre by means of tallow candles. Not only was this mode of illumination fraught with danger from fire, but the smoke and the greasy smell from the candle lights rendered actual enjoyment of a play impossible. A slight improvement was effected when oil lamps and Argand burners were substituted for the open candle flames, still the danger from fire was not lessened to any extent. The introduction of the gas light gave us increased illumination, but it also increased immeasurably the fire risk, particulary on the stage. The innumerable gas flames both on the stage, and in the auditorium, and the objectionable central chandelier in particular, created a powerful air contamination, so that good ventilation seemed almost out of the question. The electric light has not only rendered

theatres vastly better and safer from the danger of a conflagration, but it has helped to solve, more than anything else, the question of theatre ventilation. Anyone may verify this statement by visiting successively one of the modern theatres lighted by electricity and one of the older theatres lighted only by gas flames. As a matter of safety, building regulations require for theatres two kinds of illumination, namely electric lights for the auditorium and stage, and in the corridors, staircases, foyers, and exits an auxiliary system of candle or oil lamps, but it is wisely required that these auxiliary lights be set in wall niches provided with separate ventilation to the outer air. Where two independent sources of the electric current may be had, the auxiliary system of lighting may consist of electric lights supplied from a current other than that which supplies the auditorium and the stage.

VI. GENERAL SANITATION.

Having now discussed the important requirements of drainage, plumbing, water supply, ventilation and lighting, it remains to speak briefly of some matters connected with general cleanliness in theatres. From what follows it will be seen that all measures tending to insure cleanliness, will also help to improve the ventilation by removing sources of air pollution, such as indoor dust, accumulations of dirt and rubbish, slops and oily wastes, ill-kept plumbing fixtures, etc. At the same time, a due regard to these details of theatre management will render a theatre building in many respects safer from the danger of fire.

That the floors, walls, chairs and seats in a theatre building should be kept clean goes without saying, yet, in how many instances is the reverse true. All manner of rubbish and dirt should be removed from the theatre daily, both the stage floor and the entire auditorium should be swept and thoroughly dusted and cleaned out every morning. The dusting should be done in such a manner that the dust will not merely be floated into the air, to settle again upon the floor covering, the upholstery and the decorations.

The floors should be scrubbed and swept, and not made so wet as to smell murky and damp in the evening. Where possible, the hall should be flooded with outdoor air once a day. If some sunlight can be admitted all the better, for I need not tell you that sunlight is a better disinfectant than any artificial or proprietary article, no matter how well advertised.

The dust accumulating in a theatre is a far more serious danger to health than most persons are apt to think. It is but necessary to contemplate for a moment the vast amount of outdoor dust and dirt, carried daily and nightly into a theatre by the many hundreds of per-

sons who go to see a play. This dirt clinging to the shoes is partly deposited in the floor carpets, and often, I regret to say, expectorations are added, which in the case of persons suffering from pulmonary troubles, may be laden with the germs of tuberculosis. Unless the utmost care is exercised in sweeping out the floor and in dusting off the chairs and the upholstery, the finer particles are not removed but continue to float about in the air, and finally settle on the floor covering and in the plush of chairs, and are again stirred up when the new audience enters for another evening's enjoyment (?).

Little attention has been hitherto devoted to the question of suitable furniture and upholstering of audience halls. I am inclined to think that, as a sanitary measure of prevention, all plush upholstery and other material catching and holding dust, and all heavy hangings and decorations of the boxes should be done away with in theatres. Chairs covered with leather would be far better, and doubtless other sanitary furniture coverings are available. As a safety measure against outbreaks of fire, the decorations of the front of the boxes and of the proscenium opening are called for in building laws to be of fireproof material. The flatter such decorations are made, the better they are from a sanitary point of view, for they will not so easily catch or hold dust. Then there is the question of suitable, sanitary floor covering. I hold that carpets should not be tolerated. There are better, not more expensive floor coverings, such as linoleum, or the recently introduced interlocked rubber tile floor covering which commend themselves to me as vast improvements over carpets. Handsome patterns of these new sanitary floor coverings may doubtless be obtained should a demand for them for audience halls arise; but in any event, the question of decoration should in my judgment be subordinate to that of health. *"Salus publica suprema lex"* is an old saying which may be aptly applied to this entire question.

With such improved furniture and floor coverings, dusting, if done under the watchful eye of a special theatre inspector, would be freed from the ordinary ever-present dangers.

Let me add that the same person intrusted with the cleaning up of a theatre should be in charge of the proper maintenance of all toilet rooms, for here again, eternal vigilance is the price of safety. Plumbing fixtures in a public place are too apt to be abused, no matter how well arranged and frequent applications of soap, brush and hot water are necessary to keep the appliances free from odor.

In the matter of floor space allotted to each person in the audience, there is also much room for improvement. The floor area for each person should be more generous, particularly in the gallery, the seats should be wider and made more comfortable, and above all there

should be plenty of wide gangways and aisles to secure a quick emptying of the house.

In conclusion, I must mention another matter of importance in which the theatre-going public is interested. I refer to the drinking water kept in water-coolers and pitchers, or served recently in some theatres on neat trays to the patrons of the lower parts of the auditorium. The drinking water should be filtered by one of the few really germ-proof filters. These filters should be cleaned often, and occasionally sterilized. Where water is cooled by means of ice, it should be done in such a way that the melted ice will not mingle with the drinking water, for as is well known, ice frequently contains organic impurities and germs of disease and it would be useless to first filter the water and to render the same afterwards subject to pollution from impure ice.

Doubtless, many of the points brought up in my paper contain nothing new to the learned members of this Association. I hope, however, that the paper will be the means of bringing about a free discussion, which will in the end surely result in benefit to the public, for there are hundreds of theatres and amusement halls in our cities and towns, the sanitary arrangements of which are utterly bad and require a thorough remodeling. In closing this paper, let me thank the members for the kind attention with which they have listened to my remarks.

REPORT OF THE COMMITTEE ON ETIOLOGY OF YELLOW FEVER.

By HENRY B. HORLBECK, M. D., Chairman,
Charleston, South Carolina.

To the President and Members of the American Public Health Association:

Gentlemen—Your committee appointed to take into consideration and report upon the etiology of yellow fever, beg to submit the following:

Imprimis: Permit us to call to your attention and memory that at the last meeting of this body a special committee was appointed under a formal resolution, to wait upon the President of the United States, His Excellency William McKinley, and request him to recommend to Congress that a commission of expert and experienced bacteriologists to be sent to Havana to study the etiology of yellow fever.

This committee consisted of the following members of the Association:

Dr. H. B. Horlbeck.
Dr. A. H. Doty.
Dr. S. R. Oliphant.
Dr. G. M. Sternberg.
Dr. S. H. Durgin.
Mr. Josiah Hartzell.
Dr. R. M. Swearingen.

On behalf of that committee I beg to state that, with the exception of Dr. R. M. Swearingen, of Texas, who was unfortunately prevented by illness, the entire committee were present at a special audience accorded to them by President McKinley, on November 15, 1897.

A very full and clear statement was made to the President of the great necessity of a thorough study of yellow fever by a thoroughly competent commission of men qualified by attainment and reputation in bacteriological studies: this investigation to be made in the city of Havana, where material could be had at all seasons of the year; the commission to be organized so that continuous work could be prosecuted until the etiology of the disease was fully understood and fully demonstrated. The President paid the closest attention to the subject as it was unfolded to him. The committee of the American Public Health Association were received with all courtesy and respect, and the assurance was made to them that the President would give the matter his careful consideration.

The following is a copy of the address presented to President McKinley:

AMERICAN PUBLIC HEALTH ASSOCIATION,
WASHINGTON, D. C., November 15, 1897.

To the President:

SIR—At a meeting of the American Public Health Association, held in Philadelphia, October 26-29, 1897, the following resolution was adopted:

Resolvcd, That a committee of seven be appointed, to wait upon the President of the United States of America, and lay before him the urgent necessity, as viewed by the American Public Health Association, for the appointment by Congress of a commission of expert bacteriologists to be sent to Havana, for the purpose of making a thorough study of the cause and prevention of yellow fever

The following committee was appointed in accordance with the above resolution:

Dr. H. B. Horlbeck, Health Officer, Charleston, S. C.
Dr. S. H. Durgin, President Board of Health, Boston, Mass.
Dr. A. H. Doty, Health Officer, Port of New York, New York, N. Y.
General G. M. Sternberg, Surgeon General, U. S. Army.
Mr. Josiah Hartzell, Ph. D., Member State Board of Health, Ohio.
Dr. S. R. Oliphant, President State Board of Health, Louisiana.
Dr. R. M. Swearingen, State Health Officer, Austin, Texas.

It is hardly necessary to call your attention to the serious results of the recent epidemic of yellow fever in the States of Louisiana, Mississippi and Alabama, but we may be permitted to mention the fact that the great epidemic of 1878 resulted in the loss of nearly 16,000 lives, and that it has been estimated that the total loss to the country, resulting from this epidemic, was not less than $100,000,000.

If the disease had been introduced six weeks earlier the epidemic of the present year might easily have reached proportions equal to that of 1878, or of the widespread and disastrous epidemics of previous years—1853, 1867, 1873. The American Public Health Association has a membership of nearly 1,000, including the leading sanitary authorities and health officials of the United States, of Canada and of Mexico. Since its organization in 1872, it has always taken a prominent part in encouraging scientific investigations to serve as a foundation for practical sanitation, in disseminating a knowledge of the conditions which favor the extension of epidemic diseases and of the means of prevention, and in securing necessary sanitary legislation.

In our opinion the matter which we now ask you to consider is of great importance, and we respectfully request that you will bring it to the attention of the Congress of the United States at an early date in such manner as may seem to you to be best. We transmit herewith a draft of a bill, the enactment of which would in our opinion accomplish the object in view.

Very respectfully yours,

SAMUEL H. DURGIN.	H. B. HORLBECK.
JOSIAH HARTZELL.	GEORGE M. STERNBERG.
A. H. DOTY.	S. R. OLIPHANT.

Dr. R. M. Swearingen, State Health Officer of Texas, owing to illness was not able to meet with the committee.

The results of the labors of the committee were shown in the following extract of a message to the United States Congress by President McKinley, date December 6, 1897:

"In further effort to prevent the invasion of the United States by yellow fever the importance of the discovery of the exact cause of the disease, which up to the present time has been undetermined, is obvious, and to this end a systematic bacteriological investigation should be made. I therefore recommend the appointment of a commission by the President, to consist of four expert bacteriologists, one to be selected from the medical officers of the marine hospital service, one to be appointed from civil life, one to be detailed from the medical officers of the army, and one from the medical officers of the navy."

With this support the following bill prepared by your committee was duly presented to the House of Representatives by the Hon. William Elliott, of South Carolina, and placed on the calendar as H. R. Bill No. 5175. Bill herewith appended:

FIFTY-FIFTH CONGRESS—SECOND SESSION.

H. R. 5175.

IN THE HOUSE OF REPRESENTATIVES,

December 16, 1897.

Mr. Elliott introduced the following bill; which was referred to the Committee on Interstate and Foreign Commerce and ordered to be printed:

A BILL for the appointment of a commission of experts for the purpose of making investigations relating to the cause and prevention of yellow fever.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That a commission of experts shall be appointed by the President for the purpose of making investigations relating to the cause and prevention of yellow fever.

SEC. 2. That this commission shall consist of four expert bacteriologists, one to be detailed from among the medical officers of the Army, one from among the medical officers of the Navy, one from among the medical officers of the Marine-Hospital Service, and one to be appointed from civil life.

SEC. 3. That the President shall name one of the members of the commission as chairman, who shall direct the work of the commission, and report to him from time to time the results attained. The headquarters of the commission shall be in Washington, District of Columbia, and one or more of the members shall be detailed to conduct investigations in the city of Habana, Cuba, or in some other locality where yellow fever prevails.

SEC. 4. That the medical officers of the Army, the Navy, and the Marine-Hospital Service detailed as members of this commission shall receive no compensation beyond their salaries; but during the time that they are necessarily absent from their proper stations in the performance of the duties imposed upon them by this act their necessary living and traveling expenses shall be paid from the appropriation made in this act. The civilian member of the commission shall receive, in addition to his necessary living and traveling expenses, six dollars per day during the time he is actually employed in prosecuting the investigation contemplated by this act.

SEC. 5. That the sum of twenty thousand dollars is hereby appropriated, out of any money in the Treasury of the United States not otherwise appropriated, for carrying out the provisions of this act, and for the purchase of necessary instruments and material, for rent of a laboratory in Habana, Cuba, or elsewhere, and for other incidental expenses.

The bill was referred by the House of Representatives to the Committee on Interstate and Foreign Commerce.

Hopes were entertained that the provisions of the above measure would at once command the attention and support of the committee, and that the bill would become a law and be in operation immediately.

Before this bill on the calendar of the congress was reached, however, matters looking to a war of the United States with the Kingdom of Spain absorbed the almost entire consideration of that body. War was declared—now happily ended, and peace negotiations are in progress with Spain.

Your committee cannot too earnestly present to your serious consideration the continued necessity of recommending and urging by every possible method that this commission of expert investigation should be organized at as early a date as possible, and kept in continuous commission until the etiology of yellow fever is thoroughly known. With a protectorate of the United States for the Island of Cuba, constant intercourse between the United States and this island will greatly multiply. The safety and health and prosperity of many millions of our citizens are involved, and will be ever in peril while yellow fever has a foothold in the West Indies. At least 95 per cent. of all of the yellow fever introduced into the United States has come from the Island of Cuba.

Your committee suggest that President McKinley be requested to again recommend to Congress that this commission be surely organized, and ask his favorable interest in its work.

The Standing Committee to whom has been assigned the task of considering and studying the etiology of yellow fever would recall to your attention that for the last decade investigations have been made by a number of bacteriologists to find the organism that is the cause of yellow fever.

In our own country, the United States, Dr. Sternberg, Ex-President of this Association, Surgeon-General of United States Army, and a member of this committee, has visited Havana, Rio and Vera Cruz and made important contributions which have been extensively published and with which you are all familiar.

Dr. Domingos Freire of Brazil, Drs. Richardson, Charin, Capitan, Carmona y Valle, Finley, Delgado, Gibier and Havelberg have all claimed the discovery of a bacillus or microbe that was pathogenic as

to yellow fever. The picture of these bacilli cannot be hung upon the wall—these organisms, the results of great toil and labor, have not fulfilled the pathogenic requirements and have none of them been accepted among the fateful sisterhood of the fell destroyers of mankind. But these disappointments have not destroyed the aspirations or deterred the work of other laborers in these particulars.

During the past two years the hopes of the scientific world and of the millions of the different peoples of the two continents of America have been especially centred upon the labors and experiments and discoveries of Dr. Joseph Sanarelli, Director of the Institute of Experimental Hygiene of the University of Montevideo, Uruguay. A number of enlightened colleagues of this distinguished laborer have been engaged in verifying and extending his researches as to the causes of yellow fever. The result is encouraging, but, far from final; and full fruition, is in abeyance.

While a number of investigators believe the bacillus icteroides to be the true origin and source of the disease, conviction is not assured. The limits of this report forbid a too exhaustive description of the "Bacillus Icteroides." We deem, however, that a short history of the bacillus may not prove without interest.

Dr. Sanarelli states that his investigations date from February, 1896. Commissioned by the University of Montevideo he established or installed a small laboratory in the Lazaretto of the Isle de Flores, situated in the Rio de la Plata, at a few leagues from Montevideo. In this Lazaretto during the summer occur always some cases of yellow fever in individuals proceeding by the mercantile steamships from Rio Janeiro or Santos, where yellow fever constantly prevails in an epidemic state of more or less intensity. In this little laboratory at the Lazaretto on the Isle de Flores, in the Rio de la Plata, Dr. Sanarelli found an organism, differentiated it, tested it, and named it,—bacillus icteroides,—found it again and cultivated it in various media, and finally presented it to the bacteriologists of the world. This microbe has been studied by these bacteriologists, and is on its passage to oblivion or to membership among the pathogenic bacilli. There are those who believe that the long-wished-for discovery has been made, but a great deal of work remains yet to be accomplished before the fruits will be enjoyed, and before a certainty is realized.

Dr. Sanarelli claims that he has found the bacillus icteroides in 58 per cent. of the cases examined, and believes that the reason of his non-success in finding it always, is due to incidental causes. To Dr. R. Wilson, Jr., bacteriologist of the city of Charleston, we are indebted for the following description of the bacillus, taken from Dr. Sanarelli:

Dr. Sanarelli says that he has been able to isolate this germ in only fifty-eight per cent. of cases, the chief obstacle being its association with bacillus coli, streptococcus, proteus, etc. It has been found in the blood and tissues; never in the contents of the intestinal canal. Very rarely has its demonstration in the blood been possible. Morphologically, the germ is a small bacillus with rounded ends, 2-4 m. long, and one-third to one-half as broad. In culture media it often grows in pairs, but in tissue sections appears in small groups. It is very polymorphous. Demonstration of the bacilli in sections is rather difficult on account of the small number usually present. When found the groups are always located in the capillaries. The surest method of finding them in tissue is to incubate a portion of spleen or kidney, etc., for twelve hours at a temperature of thirty-seven degrees. The bacilli grow well upon all the ordinary media. In gelatine plates they form transparent round colonies of a granular appearance, which after three or four days resemble leucocytes, to use Dr. Sanarelli's simile. Later this granulation becomes more pronounced and generally an opaque neucleus appears in the central or peripheral portion. The colonies themselves become opaque in time, but never liquefy the medium.

Stroke cultures upon oblique gelatine develop in the form of brilliant and opaque droplets, somewhat resmbling drops of milk.

In bouillon a diffuse cloudiness appears, neither pellicle nor flocculent deposit being formed. Upon solidified blood-serum the growth is almost imperceptible.

Colonies upon agar-agar possess a peculiarity which furnishes an important diagnostic procedure. When developed in the incubator their appearance in no way differs from that of many other bacteria, being round, of a grayish color, slightly irridescent, transparent, with a smooth surface and a regular edge. If instead of allowing them to develop at the incubator temperature they are grown at the ordinary temperature of the room, the colonies are like drops of milk, opaque, prominent, and with a pearly reflection; that is, quite different from those grown in the incubator. This difference may be utilized for the purpose of diagnosis by allowing the plates to remain in the incubator for twelve hours and then leaving them exposed for twelve hours more to the ordinary room temperature. When this is done the colonies appear composed of a central, flattened, transparent, bluish nucleus, encircled by a prominent opaque margin, presenting the appearance of a wax seal. This appearance I have developed very beautifully by lengthening the incubator period to twenty-two hours. Dr. Sanarelli considers this striking peculiarity to be specific and to enable us to make an absolutely positive diagnosis in twenty-four hours.

The bacillus is a facultative anærobe; does not stain by Gram's method; produces an insensible fermentation of lactose, but ferments glucose and saccharose more actively; does not coagulate milk, but according to my observations imparts a reddish-yellow color to the medium after a growth of several weeks; is very resistant to desiccation; is killed in water at sixty degrees; is killed by an exposure of seven hours to the direct rays of the sun, and lives a long time in sea water.

The bacillus is pathogenic for most domestic animals. Susceptibility to the poison increases in proportion as we ascend the scale, the higher members yielding to inoculation much more readily than the lower. Transmission may be effected either through the gastro-intestinal canal or through the respiratory tract. In the dog the symptoms and lesions present a striking resemblance to those manifested by the human subject: "Emesis, hemetamesis, hematuria, albuminuria, hemorrhagic gastro-enteritis, nephritis, icterus, profound fatty

degeneration of the liver, uræmic intoxication, and a series of secondary infections." Sanarelli thinks that the picture presented by the three principal pathogenic properties of the yellow fever virus may be justly considered specific. These properties are:

1. The steatogenic property is exhibited most strikingly upon the higher animals, being at a minimum in the rabbit and attaining its maximum activity in the dog, the monkey and man. Icterus generally appears when the disease is rather advanced, and is thought to be largely, but not exclusively, due to the grave anatomical changes in the liver which produce a mechanical obstacle to the free course of the bile, thus favoring its re-absorption by the lymphatic system.

2. The congestive and hemorrhagic properties which while occurring in other cases seem here to exhibit a specific selective action. To them are due the black vomit and the other hemorrhagic manifestations of the mucous surfaces, as well as the vascular congestions which are the chief cause of the severe cephalalgia, rachialgia, etc., of yellow fever.

3. The emetic property which is marked by the rapidity, intensity and persistence with which it manifests itself in the case of man and the higher animals. The violence of the symptoms produced in the dog by an intravenous injection of a culture containing relatively few organisms and the small numbers which we find in man indicate the existence of a very powerful specific poison. The poison obtained by simply filtering a bouillon culture of bacillus icteroides twenty-four hours old, is unchanged by a temperature of seventy degrees, but is distinctly attenuated by boiling. When this solution is injected into animals which are not affected by the living virus there is no reaction. In the dog, however, an intravenous injection is followed by the same symptoms described as due to the living virus. If the dose be moderate the dog quickly recovers. If, however, the strength of the dose be much increased, or if progressively increasing doses are given on successive days, the dog succumbs, and the same lesions are found by post-mortem examination as occurred when the living virus was used. The bacteriological examination reveals a mixed infection due to bacillus coli, streptococcus, etc. The experiments upon the human subject are, according to Dr. Sanarelli, most important and contribute in a very definite and convincing manner to the establishment of the specificity of his germ. It is claimed that *"the injection of a filtered culture in relatlvely feeble doses produces in man the typical yellow fever, accompanied by its imposing train of anatomical and symptomatic events.* Fever, congestions, hemorrhages, emesis, steatosis of the liver, cephalalgia, rachialgia, nephritis, anuria, uræmia, icterus, delirium, collapse; in short, that whole mass of symptomatic and anatomical elements which by their grouping constitute the basis of the diagnosis of yellow fever," has been seen to develop under the influence of the potent poison manufactured in artificial cultures.

This is all very strong, and when we add that Dr. Sanarelli has obtained by the action of the serum from yellow fever patients upon a pure culture of bacilli icteroides the phenomena of agglutination and impairment of motility, we have to face a mass of evidence that will be difficult to overthrow.

An observation made by Sanarelli, and which I am able to verify from my own experience, is most significant. It is this, that in the presence of a growth of mould fungus the bacilli icteroides will grow luxuriantly upon media, whereon in the absence of mould its growth was either quite feeble or entirely wanting. It often happens, says Sanarelli, that gelatine plates remain

sterile for a long time after inoculation with bacillus icteroides until further inoculated with mould. "Scarcely does the mould begin to develop its mycelium than we see appearing around it, in the gelatine, a wreath of little punctiform colonies belonging to the bacillus icteroides." I have seen an appearance corresponding exactly to this description.

This fact will explain why yellow fever clings so tenaciously to ships whose damp and badly-ventilated holds are such inviting localities for the development of moulds. It will explain why yellow fever spreads first along the water front, a situation always damp and abounding in decaying vegetable and animal matter. It will explain its development and persistence in localities where a damp, pent-up atmosphere favors mouldiness.

We have thus given you a full description of this most interesting bacillus, as taken from Dr. Sanarelli, and in some particulars verified by Dr. Wilson.

Among other investigators, the brothers, P. E and John I. Archinard, of New Orleans, in connection with R. S. Woodson, M. D., U. S. A., have been studying the subject more particularly in the relation of the diagnosis by the Widal method to the bacillus icteroides. It was our pleasure to hear Dr. Archinard, at the Quarantine Convention held in Mobile, February 12-16th ult., demonstrate his discoveries; these were published in the February, 1898, issue of the New Orleans Medical and Surgical Journal. These gentlemen present a series of cases in which the test was applied, and make the following statement:

"From the above series it will be seen that in the fifty cases of yellow fever, agglutination with cessation of motion was obtained in over 70 per cent. of cases, the reaction being as characteristic as in typhoid fever cases"; and they say:

"From the above we conclude as follows:

1. "Our work demonstrates the practical value of serum diagnosis.

2. "That it may be utilized as early as the second day and be exceptionally present as late as nineteen years after the disease.

3. "That a dilution of 1-40 with a time limit of one hour is to be preferred for accuracy of diagnosis.

4. "That the dried blood method of Wyatt Johnston is perfectly satisfactory.

5. "That the serum diagnosis of yellow fever should be instituted in all countries wherein the disease may exist endemically, or which may be occasionally visited by epidemics.

6. "That it is especially valuable at the beginning of epidemics in the diagnosis of early and doubtful cases."

The above results of the experiments of Drs. Archinard and Woodson are adduced as corroboration of the Sanarelli bacillus icteroides as the cause of yellow fever. As contributory evidence we make the

following short extract from the July number, 1898, of the Journal of the Mississippi State Medical Association, in reference to cases arising at McHenry, State of Mississippi, June 11th, this year, 1898:

"From slides with specimens of blood from Jo Leggett, Mrs. Smith, Mrs. Donald and Young Switcher were sent to Dr. Archinard in New Orleans. His report was that all four contained bacillus icteroides, two giving typical reaction and two slow."

Dr. Sanarelli has presented some most interesting information as to the curation and prevention of yellow fever, which we deem of sufficient importance to call to your attention in these important interests relating to the probability of the bacillus icteroides as being the cause of the disease. We quote from "Premiéřes Expériences sur l'emploi de serum curative et préventif de la fevre jaune par le Prof. Dr. Joseph Sanarelli, Directoire, Etc.; Resumé d' une Conférence, held the 8th of March, 1898, to the Society of Medicine and Surgery of St. Paul, Brazil, published in the Annals of the Pasteur Institute, Tome XII, page 348, Volume No. 5, 25th May, 1898. Dr. Sanarelli says: "There is only one way at this date which can conduct to a specific treatment of yellow fever: it is serotherapy."

The serum destined for the protection and for the treatment of yellow fever among mankind issues from animals vaccinated against the bacillus icteroides and standing or supporting a dose of "virus amaril" (yellow fever virus), many times mortal, but this is not sufficient; it is requisite that it should be capable of preventing and curing the experimental "infection amarile" among guinea pigs. He says:

"I have already tried since a long time the serum of the horse among animals, and I have found it of strength truly remarkable. I have also tried it on man with a preventive view in injecting myself, some days before my departure from Montevideo, and during my sojourn at San Carlos di Pinhal. These, injections even in rather large doses, have demonstrated that the serum of horses vaccinated against the yellow fever was perfectly tolerated, and could in consequence be employed without danger in the treatment of that malady."

He relates the case of Pasqual B., who was found with all the aggravated symptoms (17th February) of yellow fever. He was injected with two injections, 20 cc. each, the first intravenous, the second under the skin. Five minutes after a general reaction ensued. Before the end of the day a third injection of 20 cc. serum was placed under the skin. The fifth day the patient was discharged cured. He then gives a group of fourteen patients extremely serious, and severe cases; putting aside all mild cases with vague symptoms. Among these fourteen patients ten were cured under the manifest influence of serotherapathic treatment, the relation the most evident of cause and

effect between the injections of the serum and the progressive amelioration of the principal morbid symptoms and of the general state.

In a total of twenty-two cases there were six deaths. These were very grave cases. He claims the right that with 27 per cent. curation of the first attempts, much better results will follow in the future. But to cure is not all; it is worth much more to prevent. Prophylaxis was practiced in February in the prison of San Carlo di Pinhal. This was a centre or focus of infection of yellow fever. The immediate effect was apparent; there was not another case occurring, and this under most unfavorable conditions. He cites the great importance of this prophylaxis aboard vessels at quarantine stations and in residences. There will at once be established at the Capital of the State of St. Paul a serotherapic institution against yellow fever. This institute will be installed in a few months, and will have for its aim to be most practical, and in consequence most perfect and sure to furnish the specific treatment curative and preventive against a disease so feared as to be called with reason "The plague of the American Continent."

[1]In an article published in the New York Medical News, September 17th, Dr. Frederick G. Novy, of Ann Arbor, Michigan, brings strong testimony against the Sanarelli bacillus as the cause of yellow fever. His especial argument is towards the fact that the bacillus icteroides is not killed by cold, and that the yellow fever disease is always stopped by cold. He says that "Agar cultures of the bacillus icteroides were placed outside of the window for three days during very cold weather. During the first day the temperature ranged from 2 degrees to 13 degrees C. The temperature on the second day ranged from 10 degrees to 20 degrees C., and on the third day from 0 degrees to 15 degrees C. It should be said that most of the time during these days the temperature was below 10 degrees C.

"At the end of the first, second, and third days transplantations into bouillon were made. These bouillon cultures were developed for 36 to 40 hours at 39 degrees C., and the resultant growths were in every respect normal. Each culture injected intraperitoneally into guinea pigs in doses of 1 c.c. produced death in from 18 to 20 hours. This last experiment may be considered as a crucial test of the relation of the Sanarelli bacillus to yellow fever. Freezing for three days at a temperature below 10 degrees C. had absolutely no effect on the virulence of the organism. As pointed out above, epidemics are promptly brought to an end by a sharp frost. In other words, the microbe of yellow fever is exceedingly sensitive to cold. This certainly cannot be said to be the case with the Sanarelli bacillus. This organism in its behavior to cold again shows that it is related to the colon-typhoid

1 Read before the Michigan State Medical Society, Detroit, May 6, 1898.

group. If, therefore, the Sanarelli bacillus were the cause of yellow fever, we would expect to find this disease, like typhoid fever, distributed the length and breadth of the American Continent, regardless of climatic conditions."

He deduces that "Neither the Havelburg nor the Sanarelli bacillus is the cause of yellow fever."

He says: "The etiology of yellow fever is yet to be worked out. The microbes of Havelburg and Sanarelli are to be placed in the already long list of disproved causes. The negative bacteriological results, taken in connection with the epidemiological facts observed in this disease, would seem to indicate that the cause will not be found in our group of bacteria. It is more than likely that the germ of yellow fever, as well as those of small-pox, measles, hydrophobia, etc., belongs to a group of organisms smaller than our bacteria, and as yet unknown, awaiting discovery. The recent work of Roux and Nocard on the microbe of pleuro-pneumonia already proves the existence of organisms smaller than the 'infinitely small' bacteria."

(There is great discrepancy between Sanarelli and Novy as to the influence of cold. Sanarelli says, as above, that bacillus icteroides is killed in water at 60°.)

We have endeavored to present to you the scientific researches that have been made up to this date. This subject, so vast, which we have in such a cursory manner brought to your consideration, viz: the etiology of yellow fever, must, with the immediate changes that have occurred as to the status quo of the United States in relation to the Island of Cuba, be the pregnant question for all sanitarians to consider. A centre and focus of infection of a deadly disease in a locality under our care and guidance will not be tolerated by the people of this country.

The bacillus icteroides of Sanarelli, which we have endeavored to lay before you, may or may not be the inevitable specific cause of yellow fever—but it is surely of enough importance to warrant its closer study, and that the further demonstration should be made. It is incumbent on our Association to use every endeavor to have this bacillus developed, and whether it prove to be the true cause of yellow fever or not, to know it as such, and to continue to study the etiology of a disease that affects the lives of a fourth of the citizens of the United States directly, and many more indirectly.

The universal consensus of opinion among the enlightened scientific world is that this disease of yellow fever is due to a specific organism. With such a belief it is surely an all-absorbing necessity to find it and secure mankind against its fatal embrace.

Dr. A. H. Doty, Health Officer Port of New York, under date of September 24, 1898, reports as follows:

We have been very hard at work in the laboratory since January last upon the subject of yellow fever and have been following rather closely the lines laid out by Dr. Sanarelli, with whom we have been in correspondence. Our researches in this direction indicate that the antitoxin-serum possesses rather weak preventive power. The experiments made to determine its curative power have all yielded negative results. It is but fair to Sanarelli to say that our investigations with the antitoxin-serum have extended over the past nine months only, while he arrived at his conclusions after twelve months' work with the serum. Our investigations would indicate that there is a specific bacterium which has an etiological relation to yellow fever and that this bacterium belongs to the colon group or is closely related to it. Our investigations on the subject of vaccine or a prophylactic fluid would indicate that the bacteria isolated from cases of yellow fever have preventive powers when prepared and inoculated according to Koch and Haffkine. A communication received last week from Prof. Lutz, Director of the Bacteriological Laboratory at Santos, Brazil, states that he is convinced that Sanarelli has discovered the specific organism of yellow fever, but doubts the efficacy of the serum. So that you can see the value of the latter has not by any means been fully confirmed.

ETIOLOGY OF YELLOW FEVER.

By Dr. EDUARDO LICEAGA, of Mexico,

Sixth Report Presented to the Committee on Yellow Fever of the American Public Health Association.

In accordance with the request of the Honorable President of the Committee, I have the honour of presenting to this meeting the most exact conclusions that we have been able to reach in Mexico respecting the etiology of yellow fever, prepared from data collected in the country.

1. Yellow fever is a febrile disease of a contagious character that prevails endemically in certain parts of the republic and sometimes assumes an epidemic form.

2. The only centers of endemia that exist on the coast of the Mexican republic, from Matamoros, at the mouth of the Rio Bravo del Norte, that separates us from the United States as far as Cabo Catoche, a length of 2,580 kilometers, along which the Gulf of Mexico washes the Mexican coast, are found in the Canton of Veracruz (State of that name), whilst the other covers the districts of Merida, Progreso, Temax, Tixumin y Valladolid, in the northwest part of the peninsula of Yucatan.

In no other part of the Gulf Coast does yellow fever *ever* make its appearance expontaneously.

3. Along the Pacific Coast from the northern part of the peninsula of Lower California and from the head of the Gulf of Cortez to the port of San Benito, situated on our frontier line, with the republic of Guatemala, and having a length of 6,250 kilometers, no focus of yellow fever exists. Neither is it to be found along the 3,000 kilometers of coast of the peninsula of California. On that long line of coast it has never been found in an endemic form.

4. Along the whole coast of the Gulf of Mexico, as well as of the Pacific, yellow fever may develop when imported from some other part; this statement is proved by the epidemics that have been observed at different periods and at all points on the two coasts, and a list of which will be found in the first report which the subscriber presented to this Association, when it met in Chicago in 1893.

5. The zone within which yellow fever can present itself extends along the whole littoral, from tide-water up to an elevation of 1,000 meters above sea level, and in no case has it been found to go beyond

those limits. The village of Las Animas, situated between the cities of Cordoba and Orizaba, at an elevation of 1,008 meters, is the highest point at which yellow fever has been observed. The cities of Cordoba and Orizaba are connected by a railroad much frequented by the passengers who leave the port, and both cities receive patients who have contracted the disease in Veracruz. At the time when no precautions were taken, yellow fever sometimes originated in Cordoba, and there developed to such a degree as to constitute a serious epidemic. Cordoba is situated at a distance of 105 kilometers from Veracruz, but it is only 827 kilometers above sea level. Orizaba is 26 kilometers distant from Cordoba, towards the interior, but it is situated at an elevation of 1,287 meters above sea level. People arrive there from Veracruz who have already contracted the disease, and whilst there go through the natural evolution that attends yellow fever, and whatever may be the termination, it ends with the individual and never is communicated to those who surround him, so that there is no example of a yellow fever epidemic having developed in Orizaba.

There is another city, Jalapa, which is also connected with Veracruz by railroad. The sick persons who have left the port have given rise to epidemics in the villages of San Juan and Paso de Ovejas, which are situated on the railroad; but even when yellow fever patients go to Jalapa, they do not communicate the disease to any of the people around them, nor has any epidemic ever been seen in that city. This is explained by the fact that, though Jalapa is situated at the same distance from Veracruz as Cordoba, nevertheless it has an elevation of 1,300 meters above sea level.

Persons who have contracted yellow fever in Veracruz have also come to the city of Mexico, and others in the interior, but the disease has always been confined to their own persons and has never given rise to any epidemic in any part of the central tableland of the republic.

6. Within that zone that is included below 1,000 meters above sea level, both on the gulf, as well as on the Pacific Coast, epidemics of yellow fever have developed. The disease has been imported from the Island of Cuba or New Orleans abroad, or from the foci of Veracruz or Yucatan, that I have mentioned, but never from the central tableland of the republic. A full enumeration of these epidemics, with the periods during which they prevailed, appears in the report I have above mentioned.

7. Yellow fever is contagious and that contagion may spread from the sick person to the sound persons. This fact has been proved by thousands of observations, to which I will add three recent and well-established cases. The first is that of the Pacific Mail Steamer "San Juan," which, in the month of August, 1883, left the port of Panama

and reached Mazatlan with thirty-three persons on board who were sick with yellow fever, and of whom only a few landed. As the disease had never appeared in this port or any part of the Pacific Coast, none of the inhabitants had acquired immunity against it, and the consequence was that the disease spread from individual to individual with such rapidity that on the fifth day from the commencement of the epidemic the deaths numbered twenty-two. (Praslow.) From Mazatlan the disease spread itself throughout the whole of the Pacific Coast.

In September, 1892, the steamer "May," from Veracruz carried some persons sick with yellow fever to Coatzacoalcos, and both in this town, as well as in Minatitlan, which is further up the river, it spread because it found persons who had not acquired immunity through a previous epidemic.

The other fact is negative, but at the same time of great importance, because it shows that if there is no communication between sick and healthy persons, the disease cannot spread; it is also interesting because it furnishes another example of the unquestionable efficacy of isolation. During the epidemic of 1883, which, as already stated, spread all over the coast of the Pacific, it nevertheless respected the country which lies between the rivers Mayo and Yaqui, that discharge into the Gulf of California. This territory was at the time under the control of savage Indians, and their chief, Cajeme, ordered the two rivers to be well guarded, threatening to kill anybody who crossed either stream or who landed on the coast between them. This order served a purpose, and not a single person attempted to enter the Yaqui territory as long as the epidemic lasted, nor did a single case of yellow fever appear within that territory.

These facts clearly prove that the disease is transmissible from the sick person to the healthy person when the latter had not acquired immunity.

8. The disease can be communicated by inanimate objects and the bagging in which grain is kept forms a vehicle for that transmission. Yellow fever existed in New Orleans in the year 1878, and from that port a ship sailed to Tampico with a load of grain, transmitting the disease to the persons employed in discharging the grain, and giving rise to an epidemic of yellow fever. The development of the epidemic was favored in the port of Tampico by the extensive inundation of the country round the city through the cyclone that passed along the coast and the mouth of the river Panuco shortly before the arrival of the ship.

In June of the following year a large quantity of printed cotton goods were discharged in that port that had suffered from sea water, and these goods were spread out to dry in the dwelling rooms used by

the employés of the store, a measure that was sufficient to start an epidemic that lasted till the month of December. In the year 1877 an epidemic of yellow fever spread in the town of Pichucalco, commencing in the house of a Spaniard who had received a consignment of goods from San Juan Bautista, Tabasco, where there was an epidemic. San Juan Bautista is situated a long distance from the coast, on the right bank of the River Grijalva. After leaving San Juan Bautista the goods were transported up the river in canoes, up to a point one league distant from Pichucalco, where they were landed and carried to their destination by pack mules. Nothing is known of the fate of the canoe men, but the Spaniard asserts that the whole of the muleteers fell sick. A few days after the arrival of the goods the people living in Mr. Bustamente's house were all attacked and fourteen died, and from this house the contagion spread through the whole town, making many victims amongst all classes; the only distinction being that the Indians from the colder country (San Cristobal in Chiapas) succumbed with greater facility than those from the hot country. After a few days, this unfortunate consignment of goods was carried on the shoulders of Indians to San Cristobal, but the men were, one by one, attacked by the disease on the road. The epidemic did not spread to San Cristobal, which is five days' journey from Pichucalco, and its force was greatly diminished by the month of August, although it continued on a smaller scale up to the beginning of December, when it finally disappeared.

We have examples which go to show that the disease has been transmitted through the bagging that carried corn, sugar and coffee. It is transported by the clothing of persons who have been attacked, and also by the skins which are exported from the places in which an epidemic exists.

Another material which serves for the propagation of yellow fever is the ballast which is shipped by the vessels in Veracruz after having landed their cargo. This fact has been communicated by an ex-Captain of the Port, who makes the following statement: Norwegian sailing vessels used to land their cargoes in Veracruz, and before sailing took in ballast from the beach; when they took it from that part over which the refuse of the market was thrown, especially the refuse of fish, the captain has observed that yellow fever made its appearance on board of the ship. This experience decided the sanitary authorities in prohibiting the ships from taking ballast from the spot mentioned; and since then the ballast has been taken from other parts of the beach, and this has been enough to prevent the propagation of yellow fever.

All the above statements clearly show that yellow fever can be transmitted by sea, by river and by land, and that the contagion is produced by communication between the sick and the healthy persons, and is

also transmitted by means of merchandise, which in some way or other, have been contaminated in those places in which an epidemic prevails.

9. The propagation of yellow fever through the medium of water, is not yet well established, but it is a probable cause. Some foreign authors, for instance, Netter,[1] are disposed to believe, from analogy with other infectious diseases, that water serves as a medium for the transmission of the yellow fever germ and they support this theory on the following observation by Dr. Schoofs: "During a stay of 15 days in Santos in December, 1891, at a time when an epidemic of yellow fever prevailed in that port, the disease caused from 120 to 150 deaths per day amongst the inhabitants of the city and the crews of the ships in the bay; whilst the ship "Corrientes," belonging to the Loading Company, did not have a single case on board. The doctor felt no hesitation in attributing this result to the fact that the crew of that ship drank distilled water, whilst those of the other ships in the bay drank water brought from the city of Santos, and to this he attributed the loss of a great number of men."

Dr. Gaviño, of Mexico, was in Veracruz making a study of yellow fever in company with Dr. Sternberg, and there he noted a large proportion of yellow fever cases amongst individuals who made use of water drawn from wells, cisterns, or other reservoirs, in which there was no current or in which the water might have lost its purity through the careless introduction of vessels, jars or other such object; whilst the disease rarely attacked those inhabitants who drank the water from the river Jamapa, when not infected.

Dr. Sanarelli, of Montevideo, is of opinion that water does not commonly serve as a medium for the transmission of yellow fever, expressing himself thus: [2]"Even though in those countries in which yellow fever prevails, no well considered system of observation has as yet been established, with the object of clearing up this important point in epidemology, and without disputing that infection can at times be effected by drinking water, we can nevertheless confidently assert that the hydric vehicle is not the usual means by which the yellow fever agent is transmitted. The propagation by means of water is for the present a mere hypothesis and is only based on analogies that will allow ample discussion."

The above remarks show that the transmission of yellow fever by means of water, is a very probable but by no means fully established

1 Brouardel.—Treatise on Medicine. Vol. II. Paris, 1896.

2 Sanarelli.—Yellow Fever.—Lecture given in the Faculty of Madrid on the 25th of April, 1898. Page 24.

fact. The data collected show the urgent necessity of purifying the water that is drunk by persons who are exposed to the contagion of yellow fever.

10. The general conditions that favor the transmission of yellow fever are: Humidity, heat, want of light and of ventilation. Dr. Sanarelli is of opinion that mould affords protection to the yellow fever germ, and that once it finds a lodging in the mould, it is preserved in the houses, ships and other objects that can serve as a medium of transmission. The same author believes that mosquitos can serve the same purpose.

The knowledge of these facts will be of service to us later on in the establishment of prophylactic measures.

11. Yellow fever does not assume an epidemic form every year in the Port of Veracruz and this is shown by the table of curves that has been prepared by Dr. Iglesias, and that covers a period of 24 years, between 1868 and 1892.

As a rule the epidemic increases with the temperature, in fact, the epidemics commence in the months of March and April and reach their maximum in June and July, from which they go on decreasing till the month of December. It is very seldom that the increase takes place in any other months and only exceptionally does it reach the maximum in December, in fact it has not done so except in 1880 and 1890. We sometimes have years in which not a single case of yellow fever presents itself.

The curves of temperature that have been prepared by Dr. Iglesias, show an almost constant uniformity in ascent and descent. The maximum, which is between 29° and 31° centigrade corresponds to the months of June and July. As can be seen, the epidemics of the years that are presented attained their greatest violence during the months of greatest heat and their lowest in those months in which the temperature varies between 20° and 22° centigrade, which are December and January.

Another important coincidence is this; that in the months between October and March, when the prevailing winds come from the N. & N. E., that is, from the sea, the yellow fever either entirely disappears or the epidemic touches its lowest point.

A study of these same curves shows, that there is no connection whatever between the increase of the epidemic and the amount of water precipitated by the rains.

12. The persons who have suffered from one attack of yellow fever generally acquire immunity against the disease. The cases of repetition in individuals who have already been attacked are much rarer than similar cases after attacks of typhus, measles or scarlet fever.

In all those countries in which yellow fever prevails in an endemic form, the residents of the locality are usually considered immune against the disease. Dr. Sanarelli, of Montevideo, and many Mexican physicians attribute this immunity to the gradual absorption by the inhabitants of the poison in which they live. I have presented the following hypothesis to explain the immunity enjoyed by persons who inhabit the centres of yellow fever endemia: "Starting from the unquestionable fact, that a first attack of yellow fever renders the patient immune against the disease; that this immunity is acquired whether the attack was of a serious or mild character and even when it was not fully developed; granting that in those places in which it has prevailed for many years the natives naturally acquire immunity, which they lose if the disease has not presented an appearance for a series of years, we can form a hypothesis that all those persons who thus enjoy immunity, have acquired it through previous attacks which are generally mild, sometimes abortive or sometimes undergone in early infancy. This theory is supported by the custom of many ladies who, being absent from the locality, in which yellow fever prevails endemically, return to them when about to bear children, and for the purpose of having those children acquire immunity. The theory that I now present is not mine alone, as I have heard it asserted by many physicians at Veracruz. This hypothesis is also supported by the idea which prevails in all countries where yellow fever is endemic, that there are acclimatization fevers, that is to say, mild attacks of a febrile disease, that do not present the character of yellow fever, but are evidently nothing more than mild forms of that disease, seeing that they are sufficient to produce immunity. It is more reasonable to accept this hypothesis than that of a disease different from yellow fever but capable of conferring immunity against the latter. On the other hand, observations spread over more than a century, have proved that mild attacks of typhus, scarlet fever or measles protect the patient against any repetition of the same diseases.

I respectfully submit the above ideas to the learned committee which has been charged by the American Public Health Association with the study of the etiology of yellow fever.

In conclusion, I repeat, that the above lines explain the most positive conclusions that we have been able to reach in Mexico on this subject, exclusively based on national documents.

SEVENTH REPORT ON YELLOW FEVER.

By Dr. EDUARDO LICEAGA, of Mexico,

In a series of reports that I have from time to time presented to this Association since the year 1893, I have attempted to give the positive data that I have been able to collect in the Mexican Republic, relative to the geographical distribution of yellow fever in this country, as well as all the information on the etiology of that disease, founded on national documents. For this purpose, I have during the later years, taken advantage exclusively of the official data that are collected by the Supreme Board of Health of the City of Mexico.

My principal object in these papers has been to show, through the medium of the American Public Health Association, the true condition of the Mexican Republic as regards yellow fever, as the information given in books on medicine, is generally more or less incorrect. There is a most important publication circulated in the United States, which is called "Public Health Reports," and which every month inserts reports on transmissible diseases that are sent in by the Consuls of that great republic. Amongst these reports, I find that cases of yellow fever are cited as appearing in different parts of the Mexican Pacific Coast.

During the past few years, the Supreme Board of Health of Mexico has made a careful investigation for the purpose of ascertaining whether the cases so referred to were in fact yellow fever. The results of these investigations have shown us that these cases were of "Paludic Remittent Bilious Fever." Once the Board had clearly established this fact, it notified the error to the Medical Department of Marine of the United States, through the channel of our own department of foreign affairs.

I come here to make a fresh declaration that the sanitary authorities of Mexico have firmly determined *never* to hide the cases of transmissible diseases that may come to the knowledge of the sanitary authorities, and that their official documents express the truth as far as the facts are known.

In previous years, I have presented statements of all the cases of yellow fever that have been found in any part of the territory of the Mexican Republic, during the period included between any meeting and the one following. Complying with this intention, I now come to present a report of the facts that have reached the knowledge of the Board of Health, from the month of September, 1897, until the 12th of September of the present year.

In the Port of Progreso, situated in the northern part of the Peninsula of Yucatan, we have had *six* cases of yellow fever, divided as follows:

YEARS.	MONTHS.	CASES OF Y. F.
1897	October	1
1898	January	1
1898	February	1
1898	May	1
1898	August	2
	Total	6

In Merida, which is the Capital of the same State of Yucatan, we have had the following cases:

1898,	February	3, 1 doubtful.
"	March	4
"	May	10
"	June	10
"	July	3
	Total	30

In the State of Campeche we have had four cases, distributed as follows:

1898,	July	2
"	August	1
"	September	1
	Total	4

In the State of Tabasco, we had in August of this year, four cases, of which three were found in a batallion that was stationed in San Juan Bautista, the Capital of the State, and one in a young lady of the same city.

I have mentioned these facts because it is probable that the U. S. Consul has mentioned them to the Marine Department; but a careful investigation convinced the local authorities that it was remittent bilious fever, and only thus can be explained how the disease was not propagated throughout the town whose inhabitants had not acquired immunity.

In Veracruz we have had 29 cases, distributed as follows:

1898,	June	1[1]
"	July	1
"	August	14
"	September up to 12th	13
	Total	29

In Córdoba, we had a single case in the month of August, the subject being an Englishman who had come from Tampico, landed in Veracruz and reached Córdoba by railway. The patient died in this town and the fever was not propagated, thanks to the measures taken by the authorities.

[1] This case was abortive, according to the report of the attending physician.

In Tampico, an epidemic has developed, under circumstances that I find it necessary to report. The Supreme Board of Health was notified by the First Delegate in that port that on the 24th of July of this year four people had been taken sick under suspicion of having yellow fever. The most careful investigation that could be made by the two delegates in Tampico and by the special sanitary agents who were at once sent to the port, have proved that the yellow fever was not imported by sea, but that it spontaneously appeared in different points of the city, and in residents of the locality who could not have had any communication with passengers or goods coming from infected places. On the other hand, no vessel had arrived in those days from any place in which yellow fever prevailed. The epidemic has developed, but the Board has no knowledge of the exact number of cases, and for that reason does not want to give any number; but we have an exact report of the number of deaths occurring from the 24th of July up to the 12th of September, which reaches 186.

During the year 1878 a cyclone swept over the coast of the State of Tamaulipas, including the mouth of the Panuco river, and inundated the country round the Port of Tampico. At that time the port was in the worst hygienic condition in consequence of these inundations, and just then the vessel of which I have spoken in my previous reports (in year 1878), arrived from New Orleans in an infected condition, and from it an epidemic of yellow fever spread. From that time and up to the 24th of July of this year; that is to say, for a period of twenty years, not a single case of yellow fever has been observed, and for that reason the inhabitants have lost their immunity.

The torrential rains that have fallen throughout the whole country during the last months have placed Tampico in the same sanitary condition that it had in the year 1878.

With regard to persons who have left Tampico since the appearance of the epidemic, we know of four who have carried the disease with them: one, a railroad conductor, died at a station near Monterey;[1] two died in San Luis Potosi, and another in the City of Mexico. In none of the three cities mentioned has the disease been communicated to any other person. The inhabitants of these last two cities enjoy immunity on account of the elevation above the sea level, but even in the first one, Monterey, the disease did not spread.

I must here note, that in all those points of the coast in which yellow fever has appeared, strict measures have been taken for the absolute isolation of the patients and for the disinfecting of their clothing and

[1] It is very possible that the individual who is reported to have died with yellow fever in Monterey in the Marine reports is the same as the one here reported to have died in a station near that city.

everything that they may have used, all that may have been in contact with them.

The passengers who start from Tampico pass through a medical examination before the train starts, with the object of preventing any diseased person from leaving on the train. A disinfecting station has been set up in Ciudad Victoria, situated between Tampico and Monterey. Offices for sanitary inspection have also been established in the stations which are touched by the railroads leaving Tampico, and all the other orders have been given that are necessary to prevent the spread of the epidemic.

During the whole year covered by this report, not a single case of yellow fever has been transmitted by sea. At least, this is the conviction that we have up to the present moment, and it is supported by careful investigation. This fact proves that the maritime sanitary regulations now in force in our country fill their purpose, as there has been permanent yellow fever in the Island of Cuba, on the coast of the United States bordering on the Gulf of Mexico, and in the Peninsula of Yucatan, and still the whole of the Mexican ports have been in communication with these infected ports.

During the first months of the year now reported upon, seven yellow fever patients reached Veracruz, but they were isolated in the Lazaretto on the Isle of Sacrificios and the disease did not spread to the port. The cases that have been previously mentioned relate to the months of June, July, August and September, precisely those during which no ships arrived with either infected men or goods. This clearly proves what I have already said, and also that the disease has had a spontaneous origin—that is to say, without being transmitted from any other infected place—in Campeche or in Tampico.

These facts oblige me to modify the second of the proposals presented in the report that I had the honor to forward to the Committee on Yellow Fever of this Association during the month of July, last.

I there say: "2. There are only two foci of endemic yellow fever in the whole of the gulf coast of Mexico and these foci are found in the Canton of Veracruz and in the districts situated in the northern part of the Peninsula of Yucatan."

I feel myself bound also to make this explanation: The report which I sent in the month of July to the committee was written before I had any knowledge of the two cases observed in Campeche during the same month and before, and also before the appearance of the epidemic in Tampico and before the investigation was commenced which proved that those cases were not the result of the importation of the disease.

It is, therefore, evident that we have to withdraw my absolute statement, that there are only two foci of endemia on the Mexican coast of the Gulf of Mexico.

I intend to continue my investigations of this matter, and I will take pleasure in communicating the results to this Association in a detailed manner, and for the present I satisfy myself with the declaration above made.

REPORT OF THE COMMITTEE ON THE CAUSE AND PREVENTION OF INFANT MORTALITY.

By ERNEST WENDE, M. D., Chairman, Buffalo, New York.

Your committee, to whom was assigned the duty to investigate the causes and prevention of infantile mortality, beg to report that the results of their labor have been unsatisfactory for several reasons, though instructive in certain features.

Circulars, for the purpose of collecting data, were issued to the leading health officials and to every city of over 5,000 population in the United States, with the object of obtaining facts upon which, it was believed, instructive deductions could be based.

The replies received to these circulars of inquiries, of which the subjoined is a formulated copy, were relatively few, and were in many other ways unsatisfactory or incomplete.

The explanation is found in that the scope of the information sought for was too large and the questions too comprehensive, and that many to whom they were sent were not in a position to reply, having no records for reference.

Like other failures or mistakes, however, a lesson is conveyed which will undoubtedly bear profitable results in the future.

From the data gathered and the facts ascertained, it would appear, first, that, in the smaller cities, villages and towns, there is a lack of system in public sanitary matters, no proper effort made in regard to records and no uniformity of action.

Furthermore, it is apparent that the authorities are either neglectful or inefficient, undoubtedly due to the fact that the force of health officials is constantly being changed without precedent of sanitary knowledge or experience, as a pawn for political ventures, and also to the mismanagement of the precautionary measures that should be devised and devoted to the interest of the helpless.

Again, the methods adopted to enforce such ordinances as exist, are meagre or crude, and the procedures, particularly along the line of isolation, quarantine and disinfection, selected to limit the spread of the preventable diseases of childhood, are largely in the hands of the attending physician, thus minimizing the efficiency of this needed reform by a personal factor.

A discontinuance of this blundering mismanagement in health affairs, so manifest in the smaller communities, cannot be expected until the people better appreciate the benefits derived from an efficient

administration of official supervision as now in vogue in many of our larger municipalities.

It is most satisfactory to observe, as a means of protecting the human body from the invasion of pathogenic microbes or the effect of their toxic products, that bacteriological tests, principally in regard to diphtheria, are being rather extensively resorted to both for diagnosis and release, and with this object in view, laboratories are being established in many places, and even in communities too small to warrant such equipment, arrangements are made with private laboratories or with the State Board of Health to do this important work.

Little or no information, however, was obtained as to what system was in use. This would have been interesting and instructive to know as the value of this procedure depends so largely upon the ease and rapidity with which it can be made available, and prompt information conveyed; for in the treatment of an outbreak of a contagious disease there is no method so successful, so much desired, as an arbitrary measure that will meet the conditions quickly, fearlessly and in accord with the principles of bacteriology.

It is likewise gratifying to learn that, so far as the answers show, the profession are taking full advantage of this aid in their practice and that it is the opinion of almost all that through it a reduction of the number of cases has occurred, absence of epidemics noted, more adequate quarantine and disinfection made possible, and injustice through erroneous diagnosis precluded.

The utmost care must be continuously exercised so as not to confuse diphtheria with some trivial disease, it being perfectly obvious, from its dangerous character, that it is essential to form a diagnosis as early as possible.

However, the profession as a body do not, as was often the case formerly, attempt to evade the requirements of the local health laws in regard to this and like maladies, onerous as they are.

This is most acceptable information, as commercial and personal interests are so often affected by arbitrary sanitary restrictions as to be a strong incentive for evasion, to the consequent danger to the welfare of the general public.

Again, most of the reports from smaller communities bear ostensible evidence of absence of vigilance over the wholesomeness of the water and milk supply, this being a most important feature of public sanitation, always requiring a fearless surveillance and systematic investigation in their relation to all infectious diseases.

The experience, in cities where this has been carried out, has amply demonstrated the value and necessity of such action.

Several scarlet fever and diphtheria epidemics have, in Buffalo, been averted by promptly tracing the source of infection to a particular milk route.

Other features worthy of note as being suggestive are the general absence of special facilities for the careful isolation of children, suffering from infectious disease in asylums and institutions, by means of isolation wards; also of special equipment for conditions arising during the heated term, and of any official supervision demanding proper cubic air space.

Much satisfaction is found in the general condemnation, theoretically at least, of the long tube, death-dealing nursing bottle.

It has not been ascertainable whether bottles equipped with these tubes are absolutely interdicted by ordinance.

As a matter of interest, it may be pertinent to here state that Buffalo has such interdiction through the action of the Department of Health, but that there is now pending in the courts a suit to test the validity of such action, this suit being prompted by commercial interests.

In preparation for this important litigation, to be able to demonstrate, beyond peradventure, the danger of such nursing bottles and the justification for suppressing them, the said Department of Health has resorted to a series of investigations, microscopically, bacteriologically and chemically.

Microscopic examinations of sections of an unused rubber tube taken from a nursing bottle revealed decidedly roughened and irregular surfaces. In several instances, small depressions, like bubbles, could be seen in the inner surface of the tube. It would, indeed, be difficult to designate a more efficient arrangement for the incubation of micro-organisms.

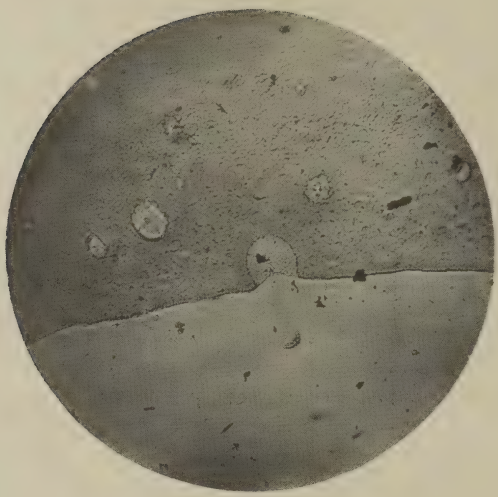
In one section, there is shown a distinct channel running from a depression on the inner surface to a bubble near the central portion of the rubber. Foreign material gaining entrance to such channels cannot be removed by the ordinary methods of cleansing.

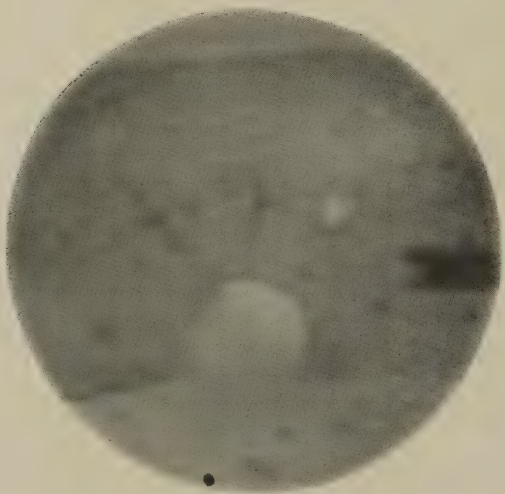
Microscopic sections and bacteriologic examinations of infected rubber tubing, obtained from a purchaser in a local drug store, revealed the following:

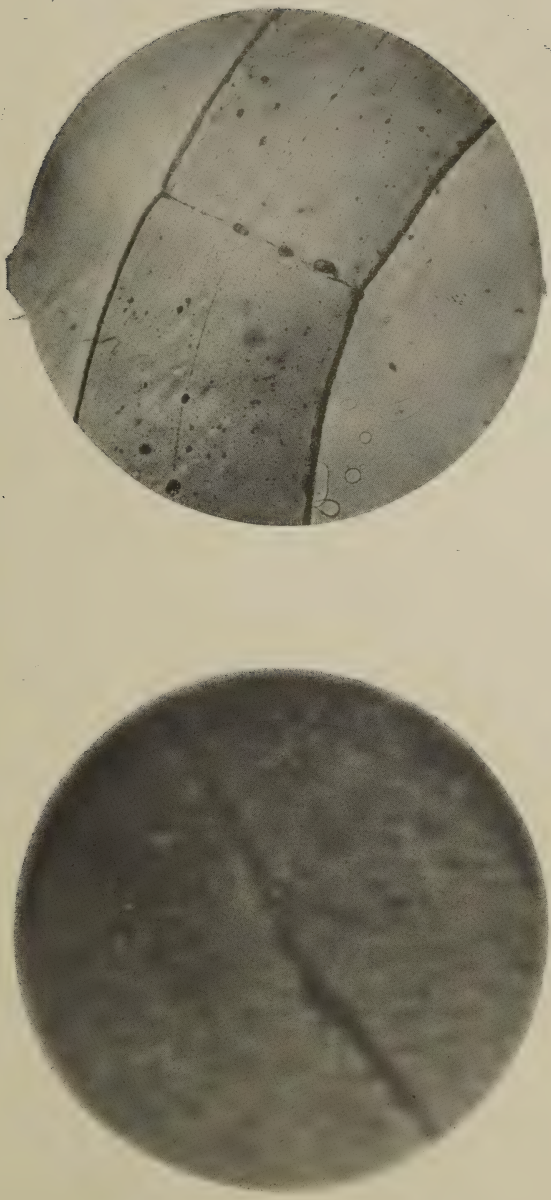
The inner surface of rubber tubing was coated with a deposit of decomposing material, this deposit being thickest at the portions adjoining the nipple and the glass tubing.

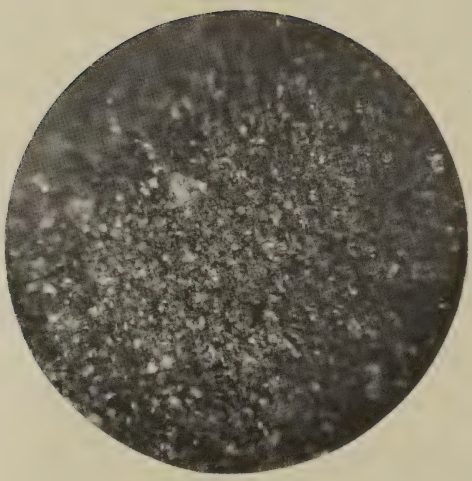
Microscopic examination of the material revealed it to be coagulated casein with innumerable bacteria of varied morphology.

Qualitative bacterial examination of the material revealed the bacillus acidi lactici to be the predominating organism; the staphylococcus pyogenes aureus present with three (3) more distinct, and,









no doubt, other species, the varieties of which have not as yet been determined.

Five decigrammes of this deposit dissolved in 2 c.c of sterile water and injected intra-peritoneal into each of three (3) full grown guinea pigs, weighing respectively 200, 254 and 261 grammes, produced death of the animals in from 48 to 61 hours.

Portions of the infected rubber tubing were placed in small vials and kept in an incubator at a temperature of 98½° F. for 21 days.

After this time, portions of the tubing were softened and completely disintegrated.

Other pieces of infected tubing, soaked for a few moments in a 5 per cent. solution of carbolic acid and subjected to the same temperature, were not similarly affected.

This demonstrates that the prolonged effect of the decomposition of milk is such as to disintegrate rubber.

This process of disintegration and softening was found, by chemical analysis and investigation, to be due to the formation of the lactate of zinc which was soft and somewhat hygroscopic.

It is proper to state here that this interesting bacteriological work was done by Dr. Wm. G. Bissell, Bacteriologist of the Department of Health of the city of Buffalo; the chemical work by Prof. Herbert M. Hill of the University of Buffalo, while the photo-micrographic work was accomplished by Mr. Thomas P. Whittier, of Rochester, N. Y.

The work of this latter gentleman cannot be too highly appreciated and its excellence is the result of long-continued original experimenting which has resulted in a process of his own.

There is a uniformity of opinion that deaths from hereditary syphilis are not recorded as such. This is to be regretted, as many deductions, concerning this common malady and its possibilities, its social and economic features, could be brought out and be of value in influencing procedures affecting its origin.

In conclusion, while the work of the committee has been unsatisfactory in several ways for the reasons stated, it is strongly recommended that such a committee be continued with the suggestion that their work be limited to one specific line at a time, so as to permit thoroughness and efficiency.

AMERICAN PUBLIC HEALTH ASSOCIATION,
COMMITTEE ON
CAUSES AND PREVENTION OF INFANTILE MORTALITY.
BUFFALO, N. Y., June 15, 1898.

DEAR DOCTOR:—The Committee of the American Public Health Association on the Cause and Prevention of Infantile Mortality take

the liberty of submitting herewith a series of inquiries to obtain certain important data.

Information of this character can only be obtained by this method from officials of your character, and to be valuable they must be accurate and available.

While the committee recognize it is considerable of a demand upon your time, they assume, in advance, that you are interested and trust that the importance of the subject will justify their request and that you will give their inquiries your very careful consideration.

All replies should be sent to the undersigned, who is

Very cordially yours,

ERNEST WENDE, M. D.,
Department of Health, Buffalo, N. Y.

Name of your city. Population.

Death rate per 1,000 for 1897—from all causes.

What is your infant mortality per 1,000?—Deaths by age for each year up to five years of age.

Is it above or below the average during the past five years, and if so, what is explanatory of the increase or diminution?

What diseases of infancy are, in your city, as shown by the returns, the most fatal in their order of frequency?

What measures are adopted to influence "preventable acute diseases of infancy?"

What results are directly noticeable, in what particular maladies, to what particular measures and in what way could such measure be made more effective?

What measures do you enforce to prevent and to check the spread of diphtheria?

Does your city maintain a bacteriological laboratory?

Is it available for the profession to submit cultures and to verify the diagnosis of diphtheria? If so, what influence has this had upon diminishing the number of cases?

Do the profession attempt to evade the correct and prompt reporting of diphtheria or attempt to evade the municipal health regulations concerning it?

What measures are directed toward the causes of cholera infantum and in what way can they be made more effective?

What supervision over and regulations are adopted towards the milk industry in its bearing towards health?

What special protective features are in force during the heated term?

What attitude is adopted towards the relation of contagious diseases to milk and milk routes and is such relationship under surveillance?

What, if any, educational literature is distributed amongst the public and particularly in the crowded districts and among the poorer classes in regard to the care and feeding of infants and in regard to contagious and other diseases among children?

How efficient, in your opinion, are your municipal health laws and regulations in diminishing infantile mortality? How can such efficiency be demon-

strated and in what way can such laws and procedures be made more effective, particularly in regard to diphtheria and cholera infantum?

What supervision or standard, if any, is adopted by law, in childrens' asylums, in childrens' hospitals, tenement houses and other municipal institutions, as regards the cubic-air space allowed per capita to each child or inmate, in health and in disease (particularly in disease)?

To what degree and in what diseases is the influence of insufficient cubic-air space most noticeable as regards the development of infantile disease and as regards their mortality?

What is your mortality from the acute diseases of infancy in infant asylums, maternity and general hospitals?

What is your ratio of infantile mortality from acute infantile diseases in relation to density of population?

What provision is made for the isolation of children, in public institutions, suffering from contagious disease?

Are fresh-air missions maintained in your city?

What has been demonstrated as regards mortality of diseases of children since their establishment?

What provision is made by public institutions in your city for the care of sick infants which may be in them and are suffering from diseases peculiar to the heated term?

Are records kept showing hereditary influence in infantile tuberculosis, and if so, state frequency of paternal and maternal influence and type of manifestation?

What influence can be shown from the crowding, density of population, tenement-house influence upon infantile tuberculosis?

What type of infantile tuberculosis is most common, and what particular factors appear to directly determine its development and what particular form?

At what age and during what months of the year are most cases reported of diarrhea in infants, and what percentage of them are true cases of cholera infantum?

What evidence can you present to establish a direct connection between bad air and such malady and between high temperature and such malady?

What, in relation to density of population?

What, if any, control is exercised by ordinance over the feeding of infants, by prohibiting the sale of improper nursing bottles, food, etc., and what character of nursing bottles are interdicted?

What type of nursing bottles are considered improper or dangerous for infant feeding and for what reasons? (Answer as fully as possible.)

What results can you show from the interdiction of such bottles, and are the ordinances relating to such matters effective?

What percentage of acute respiratory diseases form part of your mortality in infants and to what extent are they complications of acute infectious disease?

What is your mortality from hereditary syphilis and at what age?

In your judgment, are such deaths correctly reported?

What ordinances have you and what supervision is exercised over baby farming, if allowed?

What mortality is shown among them and from what causes?

Are there free municipal baths in your city and is there provision made there for the bathing of infants?

Is provision made for public parks or breathing places in the crowded districts?

Are they shady and are they patronized in hot weather by mothers with sick infants?

What amount of shade trees are there in the streets in the crowded and in the tenement-house districts?

Any other information which you may have upon this subject and not herein specified, kindly mention.

DOMINGO ORVANANOS, M. D.,
Mexico, Mexico.
JOHN COVENTRY, M. D.,
Windsor, Ontario.
BAXTER T. SMELZER, M. D.,
Sec'y, State Board of Health,
Albany, N. Y.
ERNEST WENDE, M. D.,
Health Commissioner,
Buffalo, N. Y.
Chairman, to whom reply should be sent.
Committee.

SOME OBSERVATIONS ON BOVINE TUBERCULOSIS IN NEW HAMPSHIRE.

By IRVING A. WATSON, A. M., M. D.,

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In order to show in part the experience and observations upon which some of the conclusions of this paper are based, a brief history of the official recognition of bovine tuberculosis in New Hampshire is necessary.

In 1891, the Legislature enacted a law creating a State Board of Cattle Commissioners, and also provided in the organic act that the Secretary of the State Board of Agriculture, the Master of the State Grange of Patrons of Husbandry, and the Secretary of the State Board of Health should, *ex officio*, constitute the board.

The act carried with it an annual appropriation of ten thousand dollars, and gave the board ample authority and power in every particular to take such action as it might deem best in its efforts to suppress the disease.

In the organization of the board the Secretary of the State Board of Health was made President, and the Secretary of the State Board of Agriculture Secretary and Executive Officer, and as both of these were already salaried officers of the State, no draft has ever been made for salaries upon the annual appropriation of the Cattle Commission, except for the services of veterinary surgeons and for clerical work, so that the greater bulk of the appropriation has been available to pay indemnities for cattle destroyed.

During the first two years of the work of the board the outlay was small, for the reason that the law provided that all animals destroyed should be paid for at their value in the diseased state. As the board took the ground that a tuberculous animal was practically worthless, small awards were made, and for this reason it is probable that many cases were concealed which would have been brought to the notice of the board had the compensation to the owners been greater.

In 1897, the Legislature amended the law by providing that all animals destroyed by order of the commission should be paid for at one-half the value of the animal in health.

Among the rules adopted by the board was one requiring that all applications for the examination of animals should be made through the selectmen of the respective towns. The board also established a

quarantine against cattle from Massachusetts, because it was the practice to send many herds from that State annually into New Hampshire for pasturage, and it was found that by far the greater prevalence of bovine tuberculosis was in that section of the State so used for pasturage. As a result of the quarantine regulations it was found that from 8,000 to 10,000 cattle were brought annually into the State from Massachusetts, and subsequent investigations of the board showed that very frequently tuberculous animals were disposed of for a few dollars in New Hampshire, and not taken back to Massachusetts, thus accounting for the large number of cases in that particular district. Later, quarantine was enforced in all cases where animals were brought into the State.

The people of the State, through the publications of the State Board of Health, the State Board of Agriculture, the State Grange, and addresses at agricultural and dairymen's associations, became comparatively well informed regarding this disease, as was shown by the fact that in 1895 the Legislature of the State passed, almost unanimously, a bill appropriating $100,000 for the use of the State Board of Cattle Commissioners, with which to begin a systematic examination of all the cattle in the State, and for the destruction of all those found to be tuberculous; but the Governor vetoed the bill. These facts are given in order to show how much interest has been taken in this work, and is the foundation of our belief that the cattle owners throughout the State, almost without exception, have asked for an investigation whenever they have suspected tuberculosis in their herds.

From the organization of the board in 1891, to September 1 of the present year, the Commissioners have examined 1,846 herds of cattle, the total number of which, although not recorded, represents many thousands of cattle. From this number 1,483 cattle were destroyed by order of the Board, of which 296 were condemned upon the tuberculin test, and 1,187 upon physical examination. The tuberculin test has been applied to 1,362 cattle. It should be borne in mind that examinations have been made only in cases where the disease was suspected and upon application therefor.

Fourteen hundred and eighty-three *post mortems* were made, or, in other words, every creature killed was examined. Of this number evidences of tuberculosis were found in 1,478, leaving only five cases in which the disease was not discovered.

The statement sometimes made that bovine tuberculosis may be eradicated is not borne out in practical dealings with the disease or from any point of view, except the theoretical one that it would be possible under certain conditions to destroy all tuberculous germs.

It is as well first as last to abandon the idea that tuberculosis in cattle will be eradicated, and direct our energies to reducing the disease to the lowest possible degree. In order to stamp out the disease entirely, it would become necessary to destroy all tuberculous animals and persons, and to hold all others in strict quarantine until all the existing germs of the disease were destroyed.

Suppose it were possible in a single year to destroy every case of bovine tuberculosis and to disinfect every stable, how long would it be before reinfection would take place through tuberculous persons?

We believe that if the State would maintain sufficient supervision over its cattle to destroy all cases of tuberculosis that could be detected by a careful and thorough physical examination by competent veterinary surgeons, the danger of infection from tuberculous meat and milk would be reduced practically to a minimum. This is a work, too, which would be practicable in every State and which could be carried on without extraordinary appropriations.

That this can be accomplished chiefly by a physical examination of the suspected animal, is a conclusion which we have arrived at almost wholly from our own experience. The first two or three years' work of the board was conducted entirely through physical examinations. Later we adopted tuberculin as a diagnostic agent in 1,362 cases, and 296 cattle were condemned on the evidence of the reaction from this agent. A very large percentage of these cattle, as shown by *post mortem* examinations, were in our judgment so slightly affected as not to be an element of danger to the community; while those that were so far diseased as to lead to the belief that they should be included in the really dangerous class, could have been diagnosed by physical examination. We, therefore, suspended the use of tuberculin, except possibly in an occasional case for the purpose of corroborating a diagnosis already made.

As already stated, we believe that a majority of the cattle reacting to the tuberculin test are not diseased to an extent that requires their slaughter for the protection of the public health. This conclusion has been arrived at, not only by the Cattle Commissioners of New Hampshire, but also by Massachusetts and Connecticut, at least, of the New England States.

Massachusetts up to the present year had expended the enormous sum of $700,000 in the destruction of tuberculous animals in that State, condemned largely through the tuberculin test; but this policy has been entirely abandoned, and the position taken by New Hampshire is endorsed by Peters and other prominent authorities who were formerly strong advocates of the slaughter of all animals that reacted to tuberculin.

Under this test we have destroyed many animals in which only the slightest evidences of the disease could be discovered, as, for instance, a single gland in which the tubercular process was barely discernible; in others, a single gland, or more, enlarged, filled with cheesy matter and already taking on calcification; and in still other cases, complete calcification or encystment had taken place.

It is a well-known fact that tuberculin does not in the least reveal the degree of infection. Experience has also shown that it is not so reliable a test as was formerly supposed. Salmon admitted some five years ago[1] that while "tuberculin is a great aid in the diagnosis of tuberculosis, it is not infallible, and may lead to some errors."

Prof. James Law, than whom no man in this country has done more to encourage the use of tuberculin and to cause others to place implicit faith in it, has recently written a paper on "Tuberculosis in Cattle and Its Control," published as a bulletin from the Cornell University Agricultural Experiment Station, which is a remarkable modification of his former views in regard to this disease. In this paper he cites eleven conditions under which tuberculin as a diagnostic agent is unreliable. This admission shows how impossible it is to detect, by any known agent, every infected animal in a herd.

Prof. Law admits that tuberculin has been objected to because it detects, under favorable conditions, even the slightest and most latent case of tuberculosis, some of which would recover and many would remain useful for years; and, also, "if the latent cases are to be retained in the herd and the advanced cases only removed, then truly tuberculin should have no place in your system; physical examination should be all-sufficient for your purpose."

The paper itself is one from which an argument may be made almost as well in favor of or against the use of tuberculin, from whichever point of view one prefers to look at it. He cites examples of the successful extinction of tuberculosis in infected herds through physical examination and disinfection, sufficient to satisfy the most critical, the proof of which was in the final subjection of all the animals to the tuberculin test, with the result that not a single case was found, and this in a herd of about 200 head of cattle, 50 per cent. of which had been condemned upon physical examination.

In our own experience we have found instances in which tuberculosis existed, although the animal did not react to tuberculin. As an illustration: On May 2, 1896, we were asked to examine a herd of cattle in the city of Rochester, upon a farm where, a few years previously, an entire herd of forty animals had been destroyed under the

[1] Transactions of the American Public Health Association, 1893.

tuberculin test. The herd consisted of seventeen cattle, fifteen of them reacting to the tuberculin test; but the entire herd was destroyed, and the two that did not react were found to be tuberculous like the others. A sufficient number of experiences of this kind have occurred in our own work to show that this agent is by no means infallible.

As the most efficient means of preventing the spread of tuberculosis, the conclusion has been forced upon us that sanitation must rank first. Whenever we have found tuberculosis to exist extensively in a herd of considerable proportions, we have invariably found one of two conditions in connection therewith, to wit: That the animals were stabled in close quarters, with an entire absence of proper ventilation and cleanliness, thereby maintaining an atmosphere so warm that the temperature rarely reached the freezing point in mid-winter; moist and charged with the effete stable products, thereby creating the very best possible conditions for the tubercle bacillus and its diffusion among the animals. Or, second, a degree of in-breeding among some of the thoroughbred herds that in all probability impaired the powers of resistance and rendered these animals particularly susceptible to infection.

It is a very common occurrence to find stables constructed with a deliberate purpose to retain the animal heat, without any attention to ventilation or other sanitary conditions. Under such circumstances, once infection is introduced into the herd, even though the diseased animals are destroyed as soon as discovered, disinfection of the stable sufficient to destroy the germs is next to, if not quite, an impossibility. The remedy lies, therefore, as far as this phase of the question is concerned, in educating the farmer and stock-raiser along these lines, and to show him that the best protection he can give his herd, not only against tuberculosis, but against other diseases from which cattle occasionally suffer, lies in sanitation.

Imagine what it means when we speak of disinfecting a stable constructed in this way, with a cellar, or basement, damp in itself, never exposed to the sun, into which all the excrementitious matter of the stable is deposited. Imagine such a stable thoroughly infected with a germ which we are told lives almost indefinitely under conditions of moisture associated with nitrogenous matter, the latter of which has accumulated everywhere in the stable, not to speak of the great masses of material gathered in the cellar. Disinfection under such conditions would be only partial at the best, and might not protect animals introduced into such a stable, even if not for two or three years afterward. The complete eradication of the tuberculous germ from an infected stable, except through absolute abandonment

for a series of years, is very improbable, especially under unsanitary conditions.

On the other hand, we believe that if particular attention were given to the sanitary construction and care of stables, the danger from the spread of the disease in a given herd, even though a tuberculous animal were in it, would be relatively small. This premises a stable in which there is sufficient cubic space per creature, with ample ventilation, light and dryness, all of which conditions are attainable in most localities. With stables kept in a thoroughly cleanly condition, frequently swept and washed, with the addition of some disinfectant and the segregation of animals discovered to be diseased, we believe the spread of tuberculosis would be practically *nil.* It is in this connection that we wish to present some evidence corroborative of the assertion that the disease may be arrested, based upon an experiment made by the New Hampshire Cattle Commissioners during the past year:

June 12, 1897, a herd of thoroughbred Holstein cattle were examined under the tuberculin test, twelve of them failing to pass. Two of these were in an advanced stage of tuberculosis, and were destroyed. Of the remaining animals, one was a thoroughbred Holstein bull, weighing over 2,000 pounds, and all were under four years of age. All these animals were tested with tuberculin September 12, December 9, February 23, and on May 9 those that were living on that date were again subjected to the test.

Five of the ten animals passed the test of September 12, and five, including the bull, failed to pass. Owing to the inconvenience of keeping the bull and the supposition on the part of a few people that he was badly diseased, he was killed soon after the test in September, although there was no indication of the disease upon physical examination. The *post mortem* revealed only the slightest evidences of tuberculosis.

The nine remaining animals were placed upon an isolated farm, where they were given proper sanitary care, including good ventilation, light, and moderate feed. They were kept in the open air day and night, except in stormy weather.

As a result of the test of December 9, only three of the animals reacted, and in one of these the disease was sufficiently developed to be detected by physical examination. These three animals were again tested on February 23, with no material change, and on March 29 were destroyed, the one condemned upon physical examination proving to be a well-developed case of tuberculosis. The other two killed at the same time exhibited no external evidences of the disease, and only the slightest traces were found upon a most thorough *post*

mortem, the condition being such as to lead to the belief that the disease was not only being reduced, but was on the way to ultimate recovery.

The six remaining animals were tested with tuberculin February 23 and May 9, and each time passed the test successfully. Upon physical examination they appeared to be in perfect health, and a little later they were returned to the original owner, who was a cultured and wealthy business man, and who was perfectly satisfied with the result of the examination. The action of the board was, however, criticised in certain quarters, undoubtedly for special and individual purposes, and we therefore determined to destroy the animals and make a careful *post mortem* examination, in order to determine whether or not our conclusions were correct. Accordingly in August they were killed and an autopsy made in the presence of the Commissioners, a competent veterinary surgeon and several witnesses, with the following results:

A careful autopsy was made in each case. All the internal organs were searched for evidences of disease, which were found only as stated below:

No. 1. (3790) A small encysted mass, as large as a medium sized walnut, was found near the apex of one lung. Two of the bronchial glands were somewhat enlarged and filled with caseous matter of a thick consistency. These were the only lesions found. No evidence of recent inflammatory action or pus. All the other organs were in a healthy condition.

No. 2. (52) Two of the bronchial glands were enlarged and filled with caseous matter. On a small portion of the left lung, adjacent to the fifth rib, were found granulations, probably miliary, and which also appeared in a small patch on the ribs contiguous to the granulations on the lung. No inflammatory condition existed, and no other evidence of disease was found.

No. 3. (——) Bronchial lymphatics slightly enlarged and containing a small amount of cheesy material, apparently encysted. No other evidence of disease.

No. 4. (366) A small nodular, encysted mass, of the size of an ordinary marble, was found in the apex of one lung. No other evidence of disease.

No. 5. (363) In one of the bronchial glands was found a small mass of caseous matter, cylindrical in shape, about one-eighth of an inch in diameter and more than an inch in length, partly calcified. No other evidence of disease.

No. 6. (362) In the upper part of one lung was found a caseous deposit, encysted, the size of a small walnut, with some calcification.

In the lower part of the lung was an encysted nodule, about the size of a small cherry, containing caseous matter. No other evidence of disease.

In all the above mentioned cases a careful examination was made of those organs most likely to be tuberculous, including lungs, liver, heart, stomach, bowels, kidneys, uterus, mammary glands, mesentery, lymphatic and pigmentary glands—in fact everything except the brain and spinal cord, which it was not deemed necessary to explore.

All the cows were in an excellent condition and probably would have passed through most, if not all, slaughtering houses without any disease being discovered, with perhaps the single exception of case No. 2, in which the granulations upon the lung, being upon the outer surface, were apparent upon the removal of that organ.

In not a single case was there any evidence of active tubercular progress; no inflammatory condition existed in any of the creatures, and no pus; neither was there any evidence of a breaking down or softening of the caseous matter of the glands. In other words, the general appearance was that of an arrested progress of a condition which at some prior time of infection had caused serious local trouble in the circumscribed localities mentioned. So excellent was the general condition of all the animals that it would have been absolutely impossible for a veterinary surgeon to discover by physical examination the least evidence of disease.

If the tubercular process was arrested, as appears to have been the case, we can see no reason why the cows might not have died of old age, had they not been slaughtered. Certainly if the tuberculous material had become encysted, as was found to be the case, and slow calcification was taking place, it is more than probable that no serious disturbance or further infection would have occurred from these practically isolated products and results of a former active, morbid process. This would apply to all the cases and conditions found, with the exception of the one in which the granulations existed. Whether the cell proliferation had ceased, is a question which we are unable to answer, although the appearance of the granulation was of a limited and atrophied nature, rather than of an active growth.

A similar experiment was made in 1895-6, at the Maine Agricultural Experiment Station[1] with very similar results. A herd of ten cows and heifers that reacted to the tuberculin test were kept under observation, the last until October, 1897, each of them being subjected to frequent inoculations with tuberculin, and occasionally reacting.

Without giving a complete account of the treatment or a detailed

[1] See Annual Report of the Station, (1897).

report of the autopsies, it is sufficient to say that in five of the animals, or fifty per cent., the disease was held in check, so that it made practically no progress. In three others a little advancement was made, and in two cases had nearly reached a fatal termination when the animals were killed.

Judging from the autopsy records, there seems to be no reason why the five animals in which the disease was arrested might not have continued in good health.

As may have been inferred from the tenor of this paper, we believe that the danger from infection from bovine tuberculosis has been greatly overrated. On this point our own views have undergone a somewhat radical change from those already on record, brought about by evidences which cannot be fully discussed at this time. We are convinced that whatever danger exists arises almost entirely, if not wholly from those animals in which the disease is so far advanced that it may be detected by a competent veterinary surgeon upon physical examination, barring, possibly, the localized appearance of the disease in the udder, in which event the tuberculin test would determine the diagnosis.

It may be stated in this connection that the veterinary surgeons employed by us have become wonderfully expert in the physical diagnosis of tuberculosis after a little experience.

By what means those animals which we consider dangerous to the public are detected and destroyed is a problem which will doubtless have to be settled differently in different sections. In our own state we believe that the dairymen and stock raisers have such a wholesome fear of their herds becoming infected that they report at once even a suspicion of the disease, and then such suspected cases are examined by the commission.

But we believe that this matter should not be left wholly to this method of detection, but that a law should be enacted providing for the registration of all dairymen—in fact, of every man who sells milk; that the state should be divided into districts and that an inspector be appointed for each district, who should make an occasional inspection under the direction of the State Board of Cattle Commissioners, report the condition of all herds examined, and give instructions to dairymen, by circulars and otherwise, on the necessity of maintaining sanitary conditions, and how to do it. The registration fee should largely, if not wholly meet the expenses of the district inspections. Also, that all slaughtered animals should be inspected before being sold. Under some such system as this we believe the disease could be reduced to very small proportions, and that, too, without extraordinary state appropriations.

In conclusion we present the following propositions:

1. That it is impossible to eradicate bovine tuberculosis; but that it may, without inflicting too great a burden upon the state, be reduced to a degree that will subserve the interests of the stock raisers and likewise protect the public health.

2. That but a very small percentage of the animals infected with tuberculosis in any way endanger the public health, and that an indiscriminate slaughter of the cattle reacting to the tuberculin test is wholly unnecessary, inasmuch as many of them either recover or the disease is permanently arrested.

3. That a proper sanitary condition of stables and stable inclosures would do more toward preventing the spread of bovine tuberculosis than any other measure that could be adopted.

4. That the danger of infection from bovine tuberculosis may be reduced to very small proportions, if not wholly eradicated, by sanitary measures, inspections and physical examinations by the state, in co-operation with local authorities.

5. That such inspections, once inaugurated, could be maintained without an expense that would be burdensome to the state.

A NEW STAIN FOR BACILLUS TUBERCULOSIS.

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Contribution from the Bio-chemic Laboratory, Bureau of Animal Industry, U. S. Department of Agriculture.

PRESENTED BY. DR. E. A. DE SCHWEINITZ.

The large percentage of fat present in the bodies of the tubercle bacilli was first noted by Hammerschlag. Subsequently de Schweinitz and the writer, in the course of a general chemical study of the tubercle bacillus which is being carried out in this laboratory under the direction of Dr. de Schweinitz, found that the dried bacilli often contained as much as forty per cent. of ether soluble materal. Reports upon some of the results so far obtained in the above mentioned work have already been published by de Schweinitz or de Schweinitz and Dorset in the Journal of the American Chemical Society, 1895, 1896 and 1898; the Centralbl. f. Bakt. Parasit., and in bulletins from this department.

In pursuance of a suggestion made in one of these earlier publications, that the large amount of fatty material in the tubercle bacilli probably accounted for the difficulty experienced in staining the bacillus with the ordinary dyes, an effort was made by the writer more than a year ago to stain them with some of the ordinary dyes after the preparations had been extracted with ether and alcohol for varying lengths of time. The results obtained, however, were not satisfactory.

Shortly afterwards my attention was called to the statement that Sudan III was a useful stain for fat in histological and pathological work, and it was immediately tried upon preparations of the tubercle bacilli. This dye is insoluble in water, soluble, however, in alcohol with a red color, also in the various essential oils, in chloroform and xylol. Fat once stained with this material can be decolorized with difficulty. Daddi,[1] who first suggested the use of Sudan III in histological and pathological work recommends that Müller's fluid and glycerine be used in hardening and fixing the tissues and that absolute alcohol should not be used as a dehydrating agent, nor should the specimen be cleared in the essential oils or xylol nor mounted in Canada balsam. After trying various strengths of solutions of Sudan

[1] Arch. ital. de Biol. Vol. xxvi, p. 143, 1896. Orig. paper in Giornale d. R. Acc di Medicini di Torino, No. 2, 1896.

III in alcohol it has been found that the following methods give the most satisfactory results.

1. *Staining of tubercle bacilli in pure cultures.* Cover glass preparations were made and fixed in the ordinary way and then immersed in a cold, saturated eighty per cent. alcoholic solution of Sudan III for five minutes. The excess of stain was then removed by washing in several changes of seventy per cent. alcohol for five minutes. The results obtained were very satisfactory and the characteristic appearance of the tubercle bacilli could be very readily noted. The bacilli are stained somewhat better if left in the Sudan III for ten minutes and then washed in the seventy per cent. alcohol. The germs are found stained a bright red and the beaded appearance is very distinct. Cultures of the bovine tubercle bacillus, and also of the tubercle bacillus obtained from swine, treated with this dye, were not apparently as well stained as in the case of the bacillus of human origin. These results should be verified, however, and further work with these and tubercle bacilli from various sources is in progress. The human tubercle bacilli stained with Sudan III are not decolorized by washing for two minutes with dilute one-twenty-fifth sulphuric, hydrochloric or nitric acid, or ammonia.

2. *Staining of preparations from a gland of a tuberculous guinea pig, and from sputum which had been proved to contain tubercle bacilli.* The preparations were fixed as usual and immersed for ten minutes in a saturated eighty per cent. alcoholic solution of Sudan III. They were then washed from five to ten minutes in seventy per cent. alcohol. Upon examination the tubercle bacilli were found to be stained a distinct red and presented the characteristic appearance. No other bacilli present in the sputum had been stained by the Sudan III, though they were evident in quantity when the preparation was counter-stained with methylene blue. The tubercle bacilli still retained their characteristic red color and appearance.

3. *Sections of a tuberculous lung.* Sections from the lung of a man who died of bronchial tuberculosis[1] were stained from five to ten minutes in a concentrated eighty per cent. alcoholic solution of Sudan III, washed from five to ten minutes in several changes of seventy per cent. alcohol, counter-stained with methylene blue, dehydrated with absolute alcohol, cleared with clove oil and mounted in Canada balsam. In this preparation the tubercle bacilli were stained red and could be distinctly seen lying in the tissue. The material from which the sections were made was prepared in the following way: Pieces of the lung were placed in absolute alcohol and allowed to remain for a

[1] The material was kindly furnished by Dr. Carroll of the Army Medical Museum.

week, then changed into a fresh lot of alcohol, and from that passed through alcohol and ether into celloidin in the usual way. The sections, after staining, were also dehydrated with alcohol, but in spite of this fact, the tubercle bacilli were well stained by Sudan III. It is thus evident that their staining properties are not influenced by the dehydrating action of the alcohol. This differs from the method prescribed by Daddi in staining sections for fat, as he recommends that care should be taken not to dehydrate with alcohol or clear with clove oil. Possibly the fatty material in the bodies of the tubercle bacilli is not as soluble as that deposited in the tissues. It should be noted, however, that preparations stained with Sudan III and mounted in Canada balsam did not retain a bright color after a month's time.

To demonstrate further that Sudan III is apparently a selective stain for tubercle bacilli, I endeavored to stain the numerous varieties of bacteria found in decomposing sputa, pure cultures of hog cholera, glanders, typhoid, anthrax, symptomatic anthrax, diphtheria and prodigiosus bacilli, the spirilla of Asiatic cholera, and the staphylococcus pyogenes aureus, with negative results. Preparations of the smegma bacilli were also made, but did not stain with Sudan III, although they were stained with carbol-fuchsin according to the ordinary method. In a mixed preparation of tubercle and smegma bacilli, stained with Sudan III and well washed with seventy per cent. alcohol, the tubercle bacilli appeared characteristic, while the smegma bacilli remained unstained, although this same preparation, when subsequently stained with carbol-fuchsin, showed smegma bacilli present in abundance. It would appear from the results so far obtained that Sudan III may be considered as a selective stain for the tubercle bacillus, and that this selective action is due to the large amount of fatty material present in the body of the germ. When stained with Sudan III the characteristic beaded appearance of the tubercle bacilli is very distinct, and, as has been suggested, this beaded appearance in the staining is probably due to the droplets of fatty substance present in the body of the germ. Although smegma bacilli stain very readily with carbol-fuchsin, similarly to the tubercle bacilli, the fact that the smegma bacilli do not stain with Sudan III would indicate that their cell substance is very different from that of the tubercle bacilli.

The practical value of Sudan III as a stain for tubercle bacilli will be recognized where a rapid method is desired for staining the organism in tissues and for the purpose of differentiating without trouble between smegma and tubercle bacilli, in cases, as in urinary sediments, where the smegma bacilli might be present and throw some doubt upon a positive identification of the tubercle bacilli by the ordinary method of staining. The method takes about the same length of

time as the carbol-fuchsin method for cover-glass preparations, but as the stain is apparently a selective one for tubercle bacilli, it appears to be well adapted for routine work.

COMPULSORY VACCINATION OUGHT TO BE IMPOSED AS A PARAMOUNT NECESSITY.[1]

By Dr. MANUEL SEPTIEN, Queretaro, Mexico.

It is just one century, since the immortal Jenner announced to the world the most important discovery registered in the annals of medicine; that which undoubtedly has saved the greatest number of lives. Smallpox was in centuries past the most terrible scourge that afflicted the human race; it alone accounted for ten per cent. of the total mortality, leaving on the victims it could not carry away the marks of its passage stamped, in an indelible manner, on the whole surface of their bodies. It is true that the preserving property of cowpox was already known in Gloucestershire and in other counties of England: but Edward Jenner was the first who submitted the facts observed by the country people, to the crucible of reasoned experience, deducing from it the unquestionable prophylactical virtue of vaccination; for which, with every reason, he ought to be considered as its scientific discoverer.

For that reason, we who are celebrating our annual meeting in this integral part of his country, in the midst of his noble countrymen, and in the first century of such a glorious event, for that reason, I say it is just that we dedicate a tribute of gratitude and admiration towards one of the greatest benefactors of humanity.

But, unfortunately, neither the people nor the governments have known how to take advantage of the immense good which vaccine is capable of producing. Smallpox ought to have disappeared long ago from all civilized nations; and everybody ought to carry on their arms, as a shield, those everlasting stigmas which vaccination leaves, as a seal printed by the solicitude and paternal care of enlightened governments, whose lot it is to watch and care for the lives and health of the people, as they are the greatest blessings that man can enjoy here on earth. It corresponds to the public authorities, to put an energetic resistance to the torrent of evils which originate through the ignorance, apathy, or the prejudice of men. If we except mathematics, there is no truth that has not been denied and combated through error or passion, such is the sad patrimony of mortals; and the preservative nature of vaccine, so evident, so well demonstrated

[1] Translated from the Spanish by Joseph Tithier.

by the observation and experience of a whole century, has also been and is denied by eminent men, victims of an inconceivable obfuscation. Its practice has been, and is still repulsed in the last years of this century of light, even by the peoples most advanced in civilization. In England itself, who would believe it! there are societies such as the "Anti-Vaccination Society": "Peculiar People," and others, who have for their object the opposing of vaccination. In this very country, Lower Canada, a great popular movement was started a few years ago, headed by several distinguished medical men, rejecting vaccination. The occurrence of several serious cases of vaccinal ulcerations, probably of syphilitic origin, was the cause of this agitation which had for consequence such a lamentable end. Compulsory vaccination could not be carried out from the year 1876, till '84, and in '85 such a strong epidemic broke out, that in nine months in the city of Montreal alone, thousands were attacked by smallpox, and causing the death of 3,500 persons. Probably this is one of the most notable examples, in these latter years, of the rapid spread of smallpox. The ground was already prepared, and the only thing wanting was the sowing of the seed; a Pullman car conductor arriving from Chicago, where he had contracted the disease, was the vehicle of infection.

A great many other examples like this could be cited, showing the disastrous effects of the indolence or the preoccupation of the masses, and the weakness or the negligence of the authorities, by taking no notice of the painful teachings of experience. On the contrary; there where everybody had received the benefit of the precious virus, smallpox is almost unknown. It is in Germany, where vaccination is most extensively practiced, and there are physicians there who have never seen a single case of smallpox. Henoch, the famous pediatrist of Berlin, in his classic work on the "diseases of children," has blotted out the chapter that treats of that exanthema. Baginsky, from the same capital and as renowned as the former, also omits to occupy himself with smallpox, affirming that since the year '71, he has not observed the disease in children, and that he seldom comes across even the mild form of it, varioloid. In the German army, since they have submitted to revaccination, smallpox has disappeared. In all the large and small towns where preventive inoculation is practiced with efficiency, the epidemics are very rare and mild when they make an appearance.

But even these rare epidemics, which sometimes present alarming exacerbations, ought not to exist in these days. They are along with alcoholism, one of the blots which dim the beautiful picture of modern civilization.

The remedy is in the hand of man, and little is required to obtain it; all that is wanting is compulsory vaccination.

It is true that some years since, the law prescribed vaccination in many states, and in some it even exacts a certificate to place it beyond doubt for certain civil or social acts, but in many others nothing of the kind exists; so that this most important point depends on the private initiatory of the physicians, heads of families, or directors of public establishments. It is quite true that in all those countries in which their governments have dedicated special attention to sanitary affairs, as in ours, where laws exist regulating them, the administration of vaccine is an object of especial care; but it is also a sad and lamentable truth, that a great part of the population, who disobey and rebel against the law, do not receive the proper prophylactical benefit.

What remedy is there against this evil? Shall we despair of extinguishing such a cruel disease, when we have within our reach such an heroic one as Providence has given us? No, certainly we must not be discouraged; and I beg leave to present to the worthy American Public Health Association the following project which I submit to their consideration to obtain that object, viz: To petition the governments of the three nations represented here, to the effect that they provide more energetic laws than the existing ones, making vaccination obligatory and punishing severely those who do not obey.

The public authorities ought to exact the fulfillment of this and other sanitary precautions, with the same pressure with which they oblige the payment of taxes. As a notable example of the excellent result which coercive action produces in this matter, I will quote this very decisive fact. In my state, Querétaro, the capital, with a population of 40,000 inhabitants, is only some three kilometres distant from the town of Hercules, which contains some 5,000 persons; the relations between the one and the other town are very intimate and constant; notwithstanding in Hercules smallpox is almost unknown, while it is of very frequent occurrence in Querétaro.

In the great epidemics which have invaded this city in the last few years, in Hercules there has only been here and there a case of true smallpox and many of varioloid, the number of deaths being so few, that 13, which is the monthly average, only rose to 14 or 15 during the months of the epidemics; while in the capital the number of deaths was quadrupled. The reason of this enormous difference is evident; in Hercules, all the inhabitants, with very few exceptions, have been vaccinated, while in Querétaro this is not the case.

In the former town, a great manufacturing center, which till a few years ago belonged to Mr. Rubio, all the inhabitants were more or less directly dependent on him; he obliged them to submit to vacci-

nation and expelled from his factories those who resisted. The result of this energetic measure was the almost total disappearance of the dreadful disease.

What Rubio did in Hercules can be imitated everywhere. Whilst learning does not reach the lowest classes (and unfortunately, in this matter, even the higher ones), it is necessary to enforce the truth through fear; and obedience to the law through dread of punishment.

But still there are other very important considerations for propagating the benefits of vaccine, and with other ends besides those already known. Bacteriology teaches us that cowpox is identical with smallpox. Many years ago this identity was suspected because the vaccinal lymph transported to the cow reproduces cowpox. Now, considering the rareness of this disease in cows, and that it is only found in the persons who milk them, some observers have believed that it is never developed spontaneously in the animal, but that it is always transmitted by man in the act of milking; as it is also transmitted to other animals with which he is in frequent contact, as the horse, the pig, the dog, and even the monkey; in all of them pustules of cowpox show themselves whose lymph has been observed to produce the same effect as vaccine. The vaccinated man acquires the same immunity as the one that has had smallpox; because vaccination is nothing but smallpox modified. Well, then, observation has taught us that when two infectious diseases attack an individual at the same time, they undergo so considerable a modification that they can hardly be diagnosed. For example, that is what occurs with measles and scarlet fever. There is no doubt but that both infections present themselves in the same individual simultaneously; but neither of the two show their ordinary symptomatic features, but a strange complex, in which the signs and symptoms of both are notably modified. The same happens with typhoid fever and malaria in such a manner that they have been believed by some to be incompatible, so much are their characteristic signs changed when they are found in the same person. Syphilis and tuberculosis being so frequent in children, either by hereditary transmission or through contagion, vaccine infection also according to the same law, will perhaps produce a complete modification in those grave infections. If this is true, what a new and powerful motive it offers for our consideration, to submit all new-born children to vaccination! And anology makes us comprehend that it may possibly be so. The streptococcic infection of erysipelas has been employed with success, to combat some dermatosis, which are also of microbic origin; and even against tumors; sarcomas and carcinomas which, according to some pathologists, are equally of parasitic origin. It is of frequent observation,

at least in my country, that typhus fever when it attacks rickety and scrofulous individuals, and even those in a state bordering on tuberculosis, regenerates them completely, leaving them in a glowing state of health. In our country we have a graphic phrase to express this change: "It has undergone a 'pruning,'" and with all reason.

Many examples like these could be quoted, tending to prove that the organism does not tolerate two or more infections simultaneously: perhaps the toxines secreted by the microbes of one species, destroy or modify those of another.

It is very opportune to occupy your attention one moment more, over a very interesting point, which Dr. Edward Licéaga treated in a paper read in the XII International Medical Congress in Moscow, in August of last year. In it the learned writer proposes to demonstrate, and proves with unrefutable facts, that the vaccine of Jenner, well conserved and carefully propagated, secures immunity from smallpox indefinitely.

He begins by saying that there are questions which appear to have been definitely resolved, but are not resolved; that there are doctrines almost universally accepted, and that they ought not to have been accepted except after having been submitted to the result of new studies; such is the doctrine of the prophylaxis of smallpox.

The proofs which he presents, show they are not the experience of one single man, nor of one scientific society, but are the results of the experience of an entire nation, that of Mexico, where the theory of Jenner has been preserved intact, during ninety-three years; that is, from the year 1804, in which vaccination was introduced, down to our own days. With this brief but energetic preamble, he prevents the premature criticism that his paper would surely cause, for no other reason, than that of having proceeded from a country almost ignored in Europe up till a few years ago.

It is known that for fear of inoculating the germs of other diseases along with the vaccine, animal vaccine has been almost universally adopted in preference to human vaccine; but it is also known that its prophylactic virtue is lost after ten or twelve years on an average. For a long time the permanent action of vaccination was believed in, as Jenner taught it, and as was observed by all physicians; but from 30 or 40 years ago, that is to say, since animal vaccine was generalized in practice, the conviction was acquired that its immuning effects only lasted a limited time. Many experts sustained the indefinite preserving action, and others equally numerous denied it. The revaccination of some 300,000 men in the Prussian army put the question out of all doubt: the virus took on the great majority of the soldiers, and that put an end to the controversy. The fact is undoubt-

able: vaccination confers but a limited immunity. But has this fact been submitted to a rigorous investigation, to a conscientious criticism? Was such a fine observer, scientific and wise man as Jenner mistaken? Were so many eminent men, who were the propagandists and followers of his great work, were they also mistaken? Is it credible that smallpox preserves, as it evidently does preserve, for the whole life, from a new attack, and that vaccine, which is the same smallpox attenuated, only defends for a short time? Lastly, will vaccine infection make an exception, in this sense, to all other similar infections, such as scarlatinous, rubeolic, typhic and the same variolous? Who knows! for my part, my poor ability will not permit me, nor do I propose to solve these questions. I only beg leave to call the attention of this gathering to what happened in the Mexican Republic.

From the year 1804, in which the vaccination was introduced, with few exceptions, no other proceeding has been employed, than that called from arm to arm: well; in that country smallpox, with rare exceptions, only attacks those who have not been vaccinated.

Nor in the most severe epidemics has it ever been seen that the doctors, nurses, or the persons in attendance on the sick have been infected, provided they have been well vaccinated. Nay, in the great number of cases of revaccination that have taken place, following the advice of the European masters, the vaccine has not taken; that is, it has not developed the characteristic pustule, nor has there been any febrile reaction.

These facts have not been observed by a few isolated physicians, but as Dr. Licéaga says, are the fruit of the experience of whole nations in which the Jennerian practice has been preserved intact, and we, Mexican practitioners, have had these facts well known and proved. But to Dr. Licéaga belongs the great merit of having made the most just appreciation of them pointed out, or of having established the strict relation of the cause to the effect.

By a reasoning entirely logical, he arrives at this conclusion: experience and science advise the return to Jenner's practice in order that vaccination will again attain the production of indefinite immunity against smallpox. In fact, if the human vaccine, which we employ in Mexico, confers unlimited immunity, and the animal vaccine, which is employed in other countries, only confers immunity for a certain time; and if this difference cannot be explained on account of diversity of race, or of climate, it is evident that the immunizing action of the former is more efficacious than the latter, and for that reason ought to be preferred.

It cannot be attributed to a difference of race, because the European race is one of the three that people Mexico: nor to a diversity of climate, because although the half of the country geographically occupies the torrid zone, yet it offers, by its topographical configuration, all the climatological grades, from the heat of its coasts to the glacial of the mountains in the altitudes of the central table land.

Nor can it be attributed to a bacteriological character of virus distinct from that of Europe, because analysis reveals that they are identical.

On the other hand, the fear of inoculating germs of disease at the same time, is unfounded, provided care is taken in choosing the subject. The healthy child is generally known at first sight, and it is almost always easy to prove the healthiness of its parents, while the diseases from which cows suffer, and among them tuberculosis, are not easy to diagnose. Besides, the direct inoculation of animal lymph frequently does not take, and the local symptoms which it produces are much more intense. Let us hope that science will give us the explanation of these differences: that which Dr. Liceaga adopts: "It appears probable that when a virus passes through animal organisms of the same species, it acquires such a degree of firmness that its effects are always identical."

But in the meantime do not let us cast into oblivion these lessons of experience. Let us hope it will disappear very soon and forever, this which may be considered the most terrible of diseases; because it is the most fatal, cruel, and the most loathsome. The unfortunate who is not killed by it, is left with the face and the whole body covered with horrible scars; and in many cases it destroys the sight and even the hearing.

Finally, let us hope that our voices, that cry for the health and happiness of man, will not be lost in space, but that they will find an echo in the governments of our three nations, so that we shall very soon see the supreme ideal of sanitary institutions realized in the creation of a Ministry of Public Health.

That the last flashes of this century of light will not be extinguished without having erected that monument which our enlightened rulers will then have raised in honor of humanity, and for the immense benefit of the people they represent.

NOTE. After writing this essay, the European medical journals have brought the news that the government of Great Britain has declared that vaccination is no longer compulsory. Let us hope in all sincerity that this news will not be confirmed.

REPORT OF THE COMMITTEE ON DEMOGRAPHY AND STATISTICS IN THEIR SANITARY RELATIONS.

By CRESSY L. WILBUR, M. D., Chairman, Lansing, Michigan.

This committee, formerly the Committee on Nomenclature of Diseases and Forms of Statistics, has nothing new to recommend at the present session of the Association, but will devote its entire attention to the resolutions presented by it last year, which have been under consideration by the Executive Committee during the intervening time. These resolutions are as follows:

I.

Resolved, That the American Public Health Association earnestly recommends that a plan be incorporated in the act to provide for the taking of the next United States census whereby reliable representative vital statistics may be secured for the non-registration states; [and whereas, to be of value to the public health service, such statistics must be obtained by immediate registration for intercensal as well as census years; be it further

Resolved, That the American Public Health Association urges that the census service be organized upon a permanent basis, especially as regards its work in the collection and collation of vital statistics.]

II.

[*Resolved*, That a committee be appointed to secure the co-operation of registrars of vital statistics in the adoption of a uniform classification of causes of death, and the revision of the same from time to time, as the progress of medical science may require.]

III.

Resolved, That the American Public Health Association recommends that the Bertillon classification of causes of death be adopted by all the registrars of vital statistics in the United States, Canada and Mexico, as soon as the change from the systems now in use can be conveniently made.

Resolved, That the Committee on Demography and Statistics, in Their Sanitary Relations, be authorized to have printed and circulated among the registrars of the three countries, a circular containing these resolutions, the report of the committee on which they are based, the three alternative forms of the Bertillon classification, with explanatory notes on inclusion of terms and practical rules for compilation, and a list of the registration offices adopting the same.

Resolved, That a proposal be made for an international alliance between the registrars of the three countries included in this Association, and the registrars of France and other countries now using, or which shall hereafter adopt, the Bertillon system, and that definite plans for such alliance shall be submitted for action to the next annual meeting of this Association.

(Clauses whose passage is no longer urged are in brackets.)

Relative to resolution I, we recommend that all following the first semicolon and pertaining to a permanent census bureau be stricken out; not that it is not eminently desirable that such service should be organized upon a permanent basis, but because the expression of opinion by the Association would now be too late to produce any good effect. Congress considered the subject at its last session, with the result that a substitute bill (S. 4545) has passed the senate and is now before a special committee of the house. This bill does not provide for a permanent bureau, although, in the discretion of congress, a small permanent organization for special census work may survive the taking of the census of 1900.

It is not too late, and it is very important, that this Association urge upon congress the necessity for incorporating in the census bill some provision whereby reliable representative mortality statistics may be obtained for non-registration states, so that the amount of error, at least, of the ordinary census enumeration of mortality statistics may be known. No reliable death rates have ever been obtained by the United States censuses for the states without satisfactory registration of their own, and the ratios presented in lieu thereof in the mortality reports of the census are very unsatisfactory.

Resolution II was prepared at Philadelphia in order to provide for some active work during the past year in case the following resolution (III) should fail of adoption. It was felt that certain registrars had not given the merits of the proposed classification sufficient consideration to unqualifiedly recommend it at that time, hence it was desirable to take advantage of the large attendance of registrars and the earnest desire expressed for *some* uniform basis of agreement in order to provide for the more prompt adoption of a standard classification when the Association should finally recommend one. Conditions have so far changed since the last meeting that it would seem no longer necessary or desirable to temporize in the matter of recommending a system of classification, and therefore the committee recommends that this merely provisional and contingent resolution be considered withdrawn.

Resolution III is of the most pressing importance, and, after full consideration for another year, this committee affirms it in every

respect and urges that it be passed. It consists of three clauses which may be considered in order:

(1) The first clause recommending the adoption of the Bertillon system by all registrars of the three countries embraced in this Association has already received the practical indorsement of two of them, Canada and Mexico, and this committee, whose members for the present year all happen to be citizens of the United States, feel that American registrars should not hesitate to settle the long vexed question of uniformity in the statistics of causes of death by joining with their Canadian and Mexican colleagues.

Besides the special consideration which the members of the Executive Committee have given to this classification during the past year, it may be mentioned that the classification was printed in full in the reports and papers of the American Public Health Association, Vol. XX, page 521, having been reported at the Montreal meeting of 1894, by Dr. S. W. Abbott, then chairman of this committee. The system has therefore been under consideration by the Association for the past four years, and during this time no other classification has been proposed or advocated in its stead, nor, in our judgment, is there any prospect of any other classification meeting with equal acceptance.

As stated in our report last year, "It is not maintained that the Bertillon system is entirely perfect, nor that it may not be properly subject to revision after a reasonable time. It is believed, however, that its adoption in its present condition will afford a working basis of uniformity, and lead to general improvement along the best lines. Much energy is dissipated, and many valuable suggestions come to naught, from the utter absence of co-ordination. Working together, with a broad basis of agreement, many improvements will be made by the associated registrars and come into general use that would not be possible if each state and city continues its development along individual lines."

During the present year the province of Ontario and the states of Michigan and Vermont have formally adopted the Bertillon classification. (See supplementary report.) Dr. Bryce, of Ontario, and Dr. Lachapelle, of Quebec, have recommended its use in the coming Dominion census. With the indorsement of this Association, its general adoption by all of the registration states can be confidently anticipated.

(2) The second clause of this resolution relates to the means proposed for bringing the classification into use when adopted. The chairman may be permitted to state that he has, through the *Michigan Monthly Bulletin of Vital Statistics*, endeavored to perform a portion of this work, but of course in a very much less satisfactory

manner than if it had been executed under authority of the Association. Thanks to the aid of members of this committee and friends interested in registration, the explanatory notes on the inclusion of terms and practical rules for compilation as published in the *Bulletin* possess greater value than they otherwise would. Also a copy of the resolutions, extracts from the report referring to them, and the short and long forms of the Bertillon classification have been sent to all of the state registrars and to most of the municipal registrars of the United States.

(3) In regard to the third clause, embodying the very important proposition of an international alliance with other countries for the purpose of maintaining uniformity in the classification when adopted, and in its periodical revisions made necessary by the advancement of medical science, we can hardly do better than to quote some extracts from a letter of Dr. Bertillon, as representing the feeling of the French statistical service. While Dr. Bertillon evidently understood that the system had been adopted by the Association, instead of being merely recommended by this committee, last year at Philadelphia, this is immaterial as affecting the views expressed, which may be understood as anticipatory of what we trust will be the action of this meeting. Dr. Bertillon writes:

"I have received with great satisfaction the news that the system of classification of causes of death which I presented to the International Statistical Institute had been adopted by the American Public Health Association, at its session at Philadelphia, as it has been by several statistical administrations of the two Americas.

"I have read with very great interest the excellent report which was presented to the Public Health Association on this subject. It seems to me perfectly proper in all respects, and I would sign it with pleasure if it were my privilege to do so.

"Especially worthy of note is the passage where it says that the system of classification is not presented as being absolutely perfect, but as giving a basis of uniformity, something which is more necessary in statistics than all else. * * *

"I think, with you, that it will be necessary to agree to change the nomenclature after a reasonable period of time, in order to bring it into accord with the progress of medical science. I am entirely disposed to enter into the projected alliance on that subject. I believe that France will adopt the modifications which may be adopted, although, of course, I cannot predict with certainty her future action."

Reliable and thoroughly comparable mortality statistics are absolutely essential for the use of sanitarians, and deductions based upon them are recognized as being of the greatest practical importance in

public health work. This Association has now the opportunity to unify the statistics of a continent, besides bringing the work of mortality registration in America into the closest relations with European statistics. At present the classifications used in the various states are in a chaotic condition, nearly every one being different. This is true even when the general system is apparently the same, so that data can be compared in the different registration reports only with the greatest uncertainty. In a few years, probably by 1900, if we adopt a uniform system now to be introduced into practice as soon as the exigencies of each registration office may permit, sanitarians will be able to use mortality data from the different states and countries, using the system with the utmost confidence that they know exactly what causes of death are embraced in the titles of the classification. The result will be a marked impetus to general sanitary progress, and the special promotion of those international comparisons of the prevalence of diseases from which so much of value may be expected during the coming century. Respectfully submitted,

CRESSY L. WILBUR,
CHARLES V. CHAPIN,
H. M. BRACKEN,
A. G. YOUNG.
Committee.

SUPPLEMENTARY STATEMENT.

As recommended by the Association, I early began a correspondence with the several members of the committee, in order to learn their ideas as to the form which this report should take, and later, in July, a draft of the report in the above form was submitted to them for final approval. This report, which confined itself to urging immediate action by the Association upon the resolutions introduced by the committee last year at Philadelphia, has become, in less than sixty days, quite obsolete. I am thoroughly glad to say that the march of events toward a uniform system of classification has been so rapid in the last few weeks that it would seem quite unnecessary to urge upon the Executive Committee or this Association, favorable action upon those resolutions. They are imperatively demanded by the logic of events. A great work has unfolded itself before the Association in initiating uniform mortality statistics throughout this continent, and, as I fully believe, through a much wider area. The times are ripe for unity in this matter, and the dream which European statisticians have vainly cherished for half a century may come into full realization through the work begun by this Association.

The first unequivocal sign of success was given at the conference of State and Provincial Boards of Health of North America, at Detroit,

on August 10-11, 1898, where the following resolutions were unanimously adopted:

Resolved, That the Conference of State and Provincial Boards of Health of North America recommends the adoption of the Bertillon classification of causes of death as soon as such change can be conveniently made from the systems now in use in registration offices;

Resolved, That the governments of the United States, Mexico and Canada be likewise requested to make this classification the basis of the mortality statistics of the censuses of 1900 and 1901.

Since the beginning of the present year, 1898, the following states have adopted the Bertillon classification: Connecticut, Indiana, Maine, Maryland, Michigan, Minnesota, New Hampshire, North Carolina, Pennsylvania, Rhode Island, Vermont and Wisconsin. Several others are only awaiting the formal action of this Association, so that the work of national unity for the United States will have been practically accomplished at the instant the resolutions are passed. In Canada the province of Ontario has adopted the Bertillon system since the beginning of the present year, and as Quebec has been using it for some time, it may be considered the official system of the Dominion. Mexico has also officially adopted this system, through the Superior Board of Health, the state of San Luis Potosi having first made practical use of the same.

As soon as the acceptance of the classification by American registrars appeared certain, thus making its use general in the three countries represented in this Association, it became necessary to consider how we might enter into relations with other countries using the system, and notably with France, in order to provide for its general revision from time to time. It was desirable, also, that as many countries as possible should be induced to employ this system, and the time seemed especially opportune for this purpose, because, by the use of due diligence, the revision might be completed and put into general use by the beginning of the next century. Much depends upon the employment of a suitable plan of revision and upon the proper representation of the different countries. There will be a meeting of the vital statisticians of the world at Paris in 1900, at the session of the International Congress of Hygiene and Demography, in connection with the general concourse of the nations to the International Exposition, and it would seem that no better means of announcing the results of the first revision could be had than through that congress.

The preparation of a plan for revision was immediately necessary, and in submitting the following draft to the consideration of this Association, I may say that it has already received the approval of the

highest statistical authorities of France, and has been favorably received by the registrars belonging to this Association whom I have been able to consult in the very brief time at my disposal.

PROPOSED PLAN FOR AN INTERNATIONAL DECENNIAL REVISION OF THE BERTILLON CLASSIFICATION OF CAUSES OF DEATHS.

In view of the probable formal adoption of the Bertillon classification of causes of death by the American Public Health Association, the selection of a plan of international revision becomes at once a pressing practical necessity. Immediate action is necessary in the work of revision in order to accomplish the work in the time available. Much will be lost if the revised classification is not ready for use by 1900, so that the statistics of the next century may begin on a uniform basis. The work of revision should be thorough, and the wishes of all the countries and registration offices taking part in the same should be consulted. No absolutely fixed plan can be adopted at the present time, until opportunity shall be given for extended correspondence with the representatives of France and other countries taking part in the revision. Some general expression of the wishes of the Association, as representative of the three countries, Canada, Mexico and the United States, should be adopted, and working commissions should be appointed at once and engage immediately in the preliminary steps of the revision. Such commissions could report the detailed plan acceptable to the different countries at the next session of the Association for its formal sanction, but no time should be wasted in waiting for such action. In short, responsible commissions should be appointed with considerable discretionary power, exercised in accordance with the general wishes of the Association, and they should proceed to the immediate accomplishment of the necessary work, regularly reporting progress to the Association.

General Principles.

1. A regular periodical revision is necessary for every classification of causes of death in order to keep it abreast of scientific advancement in the knowledge of diseases.

2. It is desirable that as many countries as possible signify their adhesion to this system and take part in its revision, which should be completed by 1900, in order that the international mortality statistics of the twentieth century be compiled on a uniform and strictly comparable basis.

3. All countries adopting this system and taking part in its revision should honorably conform their statistics to the resulting code of statistical procedure.

4. It is right that the wishes of countries making the largest practical use of this system should have the most weight in its revision. Therefore, as the registration of deaths is sometimes imperfect or may not extend over the entire extent of a country, the BASIS OF REPRESENTATION (voting weight) of a statistical office should depend upon the number of deaths registered, compiled and published by it in a year, and not upon the population represented.

5. Suggestions for changes are desirable from all demographers, clinicians, pathologists, statisticians, sanitarians, and, in general from all persons making use of mortality statistics. The decision as to the advisability of proposed changes should remain with the registration offices practically engaged in the preparation of mortality reports.

6. Continuity is very important in statistics, for which reason no change should be made unless imperatively demanded. Therefore, for the sake of greater conservatism, it would seem advisable that no change be made from the methods now in use unless demanded by at least two-thirds of all the ballots cast.

7. While no changes or modifications should be introduced into the mortality tables during the period between the periodical revisions, the commissions charged with the work of revision should remain in office until their successors are appointed for the next revision, so that any new questions of classification, or disputed points of classification arising in the meantime, may be referred to them for decision.

8. This revision is purely a statistical matter, and will be best conducted by purely statistical methods.

Plan of Procedure.

Article 1. Each country shall have a national commission of three members, representing the central statistical office for the registration of deaths, if any. For Canada, Mexico and the United States these commissions shall be appointed by the President of the American Public Health Association, with the approval of the Executive Committee. These commissions shall be first appointed during the year 1898, and new commissions shall be appointed every ten years thereafter, each commission serving until the appointment of its successor.

Article 2. Each national commission shall elect one of its number as secretary, and shall issue to all of the registration offices in its jurisdiction a statement of the purpose of this system of international revision, a copy of the Bertillon system of classification as now in use, and request that any desired changes be suggested on blanks of the form provided, and sent to the national secretary on or before June 30, 1899.

Article 3. The secretary of each national commission shall tabulate all of the suggestions received by him from his jurisdiction on or

before June 30, 1899, showing (1) the tabular number of the list affected; (2) the proposed change; (3) the reasons alleged for same; (4) who proposed such change; (5) the individual or joint opinions of the members of the national commission as to the expediency of such change. This tabulated report the secretary of each national commission shall dispatch on or before September 30, 1899, to the secretary of every other national commission.

Article 4. The secretary of each national commission, upon receipt of the proposed changes from the secretaries of all the other national commissions, shall add their reports to his own, with the addition of such opinions of the members of the national commission as may be given on any particular question, and shall submit the whole to all of the constituent registration offices in his country for ballot on or before December 31, 1899.

Article 5. The constituent registration offices are: (1) The national office, if a country has one central office, as in England, handling the statistics of the entire country; (2) the state or provincial offices in countries having no national system of mortality registration, as in Canada and the United States; (3) city registration bureaus, where there is neither national nor state registration of deaths. The right to vote should proceed in the above order, to avoid duplication, a city being represented only when it is not included in a state system, and a state when it is not included in a national system.

Article 6. Each constituent registration office shall cast one (1) vote for every thousand deaths registered, compiled and published in its last published annual registration report. Fractional thousands shall not be counted. Each office shall mark "yes" or "no" opposite each question submitted by the national secretary, and shall return the ballots to him on or before March 31, 1900. If "yes" or "no" is not marked opposite any question, the office shall be understood as not voting thereon A copy of the last published registration report of each office must accompany the ballot when transmitted to the national secretary.

Article 7. Census offices collecting mortality statistics shall be admitted to a vote for such portions of a country only as are not covered by state or municipal registration offices, and their basis of representation shall be ten per cent. if decennial, or twenty per cent. if quinquennial, of the total deaths recorded for such non-registration area.

Article 8. Each national secretary shall tabulate the ballots received from his country, which work shall be examined and certified to by the other members of the national commission, and present the same at a joint session (international commission) of all of the national commissions, to be held at Paris at the time of the International Congress of Hygiene and Demography in the year 1900.

Article 9. The international commission shall proceed to elect a secretary, who shall combine and tabulate the ballots of all the countries on each proposed change, and, after submission to each national secretary for final review shall announce the result of the international ballot.

Article 10. Two-thirds of all votes cast shall be necessary to make a change. All changes made shall be announced by the international secretary, through the several national secretaries as early in the year 1900 as possible, so that the revised classification may go into effect in the year 1901..

Article 11. The standard classification to be referred to in all proposed amendments is that of the city of Paris for the year 1894, or the authorized translation issued in the language of each country by its national commission. After the production of a revised complete classification, the several national commissions shall be authorized, through the international secretary, who shall consult all of the national commissions, to recommend various consolidated or shorter forms for use in municipal statistics and for other purposes; also to settle new points of classification or inclusion of terms not determined by the revision, such decisions to be operative until the points in question can come up at the next decennial revision.

(Sample of blank proposed for suggested changes.)

FIRST INTERNATIONAL DECENNIAL REVISION OF BERTILLON CLASSIFICATION OF CAUSES OF DEATH—PARIS, 1900.

Argentina, Mexico, Brazil, Russia, Canada, United States, France, Uruguay, etc., etc.	National Commission for the United States under the auspices of the American Public Health Association.

Affects No.....of the Tabular List.

Proposed Change:

Reason;

Submitted by _____

(Official Title)_____

(Address)_____

Dated_____189___

NOTE.—All proposed changes must reach the National Commission on or before June 30, 1899. Use a separate blank for each proposed change, stating the reasons as concisely as possible.

On August 15, as soon as possible after the indorsement of the Bertillon classification by the Conference of State and Provincial Boards of Health of North America, the above plan of revision was submitted to Dr. Bertillon, with the request that he ascertain, as far as possible in the brief interval before the meeting of the American Public Health Association, whether the French statistical service would co-operate on the lines suggested. The following extremely prompt and satisfactory reply was received from him under date of September 8, 1898, which is given in translation:

"I have read with the most lively interest and the greatest pleasure the accounts which you were kind enough to send me relative to the adoption of the *Bertillon classification* by the American Public Health Association. I have examined the plan of organization for the decennial revision of that classification. I consider it very desirable that the revision be decennial, in order that the classification may be kept abreast of the progress of science. And I believe, with you and with the American Public Health Association, that it is very necessary to make only the indispensable changes, since each of these diminishes the comparability of the new statistics with the old ones.

"You write me, 'Will it be possible for you to assure me of the agreement of the French statistical service in our plan, at least in its general outlines, so far as to assure me of the appointment of three commissioners to represent France in the international revision?' The matter depends upon the 'Advisory Committee of Public Health of France,' at the Ministry of the Interior, of which I am a member. In ordinary times it meets each week, but at this moment most of the members are on vacation. I have written to the president of that committee, M. Brouardel, and have the pleasure of informing you that he enters fully into our views, and that the agreement of the Committee of Public Health is, therefore, not doubtful. M. Brouardel writes me: 'I shall do all in my power to have the committee accept the plan proposed by the American Public Health Association. I do not anticipate any difficulty. *You can therefore pledge yourself on this point.*' (All italics are those of the original.)

"Thus the acquiescence of the French administration is a thing *perfectly assured,* and if it is not at present actually obtained, it is because we are in summer and have only a few days to obtain a reply.

"You ask me also if the first revision cannot be made in Paris in 1900, at the Congress of Hygiene and Demography. That depends upon the Committee on Organization of this congress; it does not meet until October. M. Brouardel, who is the president, writes me that he thinks that the proposition will be placed on the program. You may consider the matter as *absolutely certain.*

"The American Public Health Association, in adopting a uniform nomenclature of diseases, realizes a considerable statistical advance, which the statisticians of Europe have sought, without being able to attain, since 1853, the date of the first International Congress of Statistics at Brussels. The question was there presented, but it is only in 1898, at Ottawa, that it could be solved."

With these extremely satisfactory assurances, there need be no hesitation on the part of the Association as to immediately entering upon this work. While there is ample time for its thorough and complete accomplishment, it is necessary that there should not be a single moment of unnecessary delay. The preparation and circulation of the Bertillon classification in its present condition, as a basis of reference in the work of revision, is the first step necessary, and this will require some little time. Full correspondence is necessary, moreover, with the registrars of Europe and South America, in order that the work may proceed on uniform lines in the different countries. The appointment of commissions will require some time in some of these countries, which may be unprovided with a central statistical administration. We shall be very fortunate if the preliminary details can be arranged for all countries and the actual work of revision be proceeding by the first of next year.

AUTHOR'S NOTE.—At this date, December 9, 1898, considerable progress has already been made in the general direction indicated in this report. Five National Commissions are already appointed, namely, those of Canada, Costa Rica, France, Mexico and the United States. It is probable that the members of the Brazilian and Argentine Commissions may be already appointed, as the Bertillon classification has been for some time under consideration by the central statistical authorities of those countries, and has already been practically employed in them. The movement is also meeting with considerable interest and approval from various European authorities, and decisive action may be expected from the International Statistical Institute at its session next year. The proposition for holding the session of the International Commission in connection with the International Congress of Hygiene and Demography at Paris in 1900 has been cordially commended, and the President of that Congress, M. Brouardel, has been named as one of the members of the French National Commission, his colleagues consisting of Drs. Bertillon and Netter. It is recommended that Article II, as given above, be amended by substituting the "Nomenclature des Maladies," issued by the Paris statistical department in 1898, in place of the form used in 1894. The original may be obtained by addressing the Secretary of the French Commission, Dr. Jacques Bertillon, 1 Avenue Victoria, Paris, while an English version will appear early in 1899. The Mexican National Commission, Dr. José Ramirez, Secretary of the Superior Board of Health, Mexico, is preparing a Spanish version of this last edition. A general announcement of the purposes of the revision has been widely distributed through the medical press of the United States by the U. S. Commission, Dr. C. L. Wilbur, Secretary, Lansing, Mich., to whom requests for any additional information should be sent.

OUGHT WE TO REOPEN THE LEPER ASYLUMS?

By Dr. JOSE RAMIREZ, Mexico D. F.,

General Secretary of the Supreme Board of Health of Mexico.

Leprosy is still found scattered throughout the world. As its origin is not of a teluric character, we can understand how it invades climates of widely different character. It is a disease exclusively confined to man, of a bacterian character, contagious and one that respects no race whatever.

A comparative study of its distribution for centuries back and in our own time, at once calls our attention to the frequency of its appearance in ancient times, before the discovery of America; to its rapid spread over the New Continent; to its subsequent progressive disappearance in Europe, which was almost complete in the more civilized parts; still more recently, showing a marked decrease in many countries of America; and lastly, its persistent continuance in Africa, and especially in Asia.

The same phenomenon has been observed with respect to the plague and typhus, diseases that serve as a thermometer to indicate the degree of hygiene of different peoples. These facts lead us to a comforting conclusion; that leprosy, an incurable disease can be suppressed in civilized countries by means that are within the reach of the sanitary authorities.

The pathology of leprosy has made great advances through two recent discoveries; that of the Hansen bacillus and the almost complete demonstration of the non-hereditary character of the disease. Since then a radical change has taken place in the understanding of the character of the disease and the manner in which it is acquired.

An empirical observation of some centuries has perfectly demonstrated the contagious character of leprosy (still denied by some physicians), and the arbitrary measures that up to the Middle Ages were employed to prevent this fearful contagion, proved by their positive results, that these observations were correct; that is to say, that the isolation of the lepers was the most certain method of preventing the appearance of fresh cases.

The existence of the bacillus in all the diseased tissues has confirmed and explained the contagious character of leprosy, because in our times and medically speaking, contagion is synonymous with parasitism, and we cannot understand the transmission of any disease

unless it is by the intervention of an organized being of a vegetable or animal character.

The existence of the Hansen bacillus and the study of the conditions under which it is developed, now permit us to explain the numerous anomalies that characterize the contagion of leprosy. With these data we are now certain that all the causes to which the development of the disease was attributed are entirely valueless, such as icthiophagus food, damp, etc. Comparative anatomy and physiology, one of which studies the interior structure of the reproducing cells, and the other, the means by which they are combined for the formation of fresh generations, have proved that in order to be fertile, they must indispensably be in a condition of complete purity. In other words, that the ovulus and the expermatozoide cannot combine with any positive results, if they contain anything that does not pertain to them, such as a bacillus or any other body which is foreign to their molecular constitution, and there are naturalists found who deny that it is possible for an ovulus to exist that is attacked by a microbe.

These facts, which appear to be established by numerous observations, have produced a revolution in the theory of the heredity of disease, because we can only understand that they could be acquired by a kind of hereditary contagion; that is to say, by the previous contagion of the feminine organism that shelters and nourishes the new being. In this way we can explain why it is that we never see a child born in a leprous condition, and also why the disease only appears at the age of six years, even this being a rare case, as the more precocious cases observed are usually found in children of ten years of age.

This new opinion, as to the hereditary character of the disease, has corrected a multitude of errors which were considered to be well founded truths, and that by disproving the long-accepted theory that children inherit the disease from contaminated parents, holds out greater hope for the future, besides allowing us to soften our sanitary precautions and in due time to adopt timely measures for preventing contagion.

Up to the present date, we have nothing to show that the disease existed in America before the arrival of Hernan Cortez in New Spain, as it is still considered doubtful whether it was known in any part of this Continent before the colonial period. What cannot be questioned is, that after the Conquest, the disease spread throughout the whole of the New Continent, so that within a few years after the subjugation of the indigenous races, hospitals for the treatment of leprosy began to appear in all the large cities.

History has informed us of what up to the present time we may call a strange coincidence, to the effect that as the disease devastated the conquered countries, it simultaneously disappeared in Europe. It is probable that this phenomenon was due to the emigration of great numbers of lepers who came over in search of a more humane treatment, far from those places where they were hunted like wild beasts, and also to the easier conditions and wealth that were acquired in Europe through the treasures found in the New World, thereby improving the sanitary conditions of those countries.

It is fortunately a fact, that in the greater part of America, also, leprosy has gradually disappeared, although it has left extensive foci, one in Columbia and the other in Brazil.

Leprosy has very rarely been found in Canada, although well established cases have been seen.

In the United States there are a few small foci, which are especially found in Louisiana, Texas, California, Minnesota, Oregon, etc., but the recent annexation of the Sandwich Islands places this nation in an especial condition to at once undertake measures of defense against that immense focus of leprosy, which is so well known and is so dangerous.

In Mexico we also have leprosy scattered in different States, forming dangerous foci in Yucatan, Jalisco, Michoacan, Guanajuato, Sinaloa, etc. This country also had hospitals which were exclusively dedicated to lepers and which had disappeared for want of patients, so that at present, legal precautions are not taken in any part of the country of any kind whatever for preventing the propagation of the disease; and according to our most competent physicians, there is no data which can lead us to believe that the number of lepers has increased within the last few years, but rather the contrary.

We, therefore, find that Canada, on account of the British colonies of India, the United States, on account of the foci in its own territory and the recent annexation of the Sandwich Islands, as well as Mexico, on account of the numerous foci it contains, are three nations which ought to come to an agreement with a view of taking steps against the propagation and for the establishment of uniform measures of prevention, as far as is permitted by the special conditions of each country.

The character of these measures is a subject that undoubtedly will give rise to a great deal of discussion. At the end of the century we cannot and ought not to put into practice the ostracism to which lepers were formerly condemned; no patient would now allow himself to be obliged to wear a special dress and to go about ringing a bell

with which to warn the public of his presence. Our customs have improved a great deal; it is not now considered necessary to treat diseased persons as wild animals that must be killed; charity has now superceded the sentiment of egoism, and a multitude of philanthropic persons dedicate themselves and their time to improving the conditions of life for a person whose health suffers; institutions that have been created for the exclusive object of saving persons from contagion prosper in all countries, and this very American Public Health Association proclaims in a loud voice that its only purpose is that of working without rest for the public health and welfare.

But, if these moral considerations now oblige us to set aside the idea that the extirpation of leprosy can be obtained by tormenting the sufferers, we are still bound to work in accordance with the discoveries of science. Now, when we know that contagion is something tangible and not a subtle gas or impalpable emanation; now, when we have at our disposal means that enable us, if not to destroy in a permanent manner the germs of the disease inside the system, at least for preventing its propagation outside of that system; now, I repeat, is the time for us to study the most adequate means in accordance with our knowledge of the etiology of the disease, so as to be able to fight it with greater success.

There can be no doubt that these humane sentiments inspired the governments that convened the international conference for the study of leprosy, which met in Berlin during the year 1897. This conference, attended by the most competent specialists of the world, and starting from the principle of the incurable character of leprosy, on motion of Dr. Hansen, passed resolutions directed to the prevention of the propagation of the disease. They are as follows:

(1) "In countries where leprosy forms foci, or has a great extension, isolation furnishes the best means of preventing the spread of the disease.

(2) "The system of obligatory notification, observation and isolation as carried out in Norway, is recommended to all nations with local self-government and a sufficient number of physicians.

(3) "It must be left to the administrative authorities after consultation with the medical authorities, to take such special measures as are applicable to the special social conditions of the districts."

These are the prophylactic measures which are supported by the International Congress of Berlin for restraining the advance of leprosy. But is this prophylaxis applicable to all countries? We do not think so and we belive that the International Conference only took into account the present condition of leprosy in Europe.

The principal obstacle to the application of these rules in Mexico, for example, consists in the guarantees which the law lays down for protecting the civil rights of the individual; but, even putting this on one side, how will it be possible to apply the rules of isolation in the Sandwich Islands, where leprosy is so general, or to certain parts of Mexico where most of the population is Indian, poor persons whose resources do not allow them to establish costly asylums in their villages, such as are required to make isolation really effective?

We well know that in Europe these measures will be of great efficacy, owing to the limited number of patients there, and the rapidity with which the hygienic conditions of most of its cities are being improved; nevertheless, and with all due respect to the resolutions of the International Conference of Berlin, we cannot but believe that these resolutions were to some extent influenced by the fear that many years ago was felt in Europe of the spread of leprosy, as we are utterly unable to explain, how obligatory isolation can be demanded for a chronic disease, how a leper can be tortured by banishment from society, when similar measures are not proposed with regard to individuals who are more dangerous and infinitely more numerous, such as consumptives.

There can be no doubt that syphilis is more contagious than leprosy, but up to the present date, no syphilitic patients have ever been shut up in an asylum.

Under these circumstances, it will be necessary for us to consider other measures, better adapted to our customs and to our social and political conditions, taking common action for the simultaneous protection of the three countries that have combined to form the "American Public Health Association." These measures of an international character will have to be arranged through diplomatic channels, but it becomes the duty of our Association to initiate them before our respective governments, so that with their approval they may be given legal form.

With respect to the provisions necessary to avoid the contagion of leprosy, in places where it is impossible to obtain isolation, we believe that they ought to be limited to those which, by the incessant work of the sanitary authorities, can be extensively brought to the knowledge of the masses, so as to make them perfectly aware of the character of the disease, its incurability, the danger of contagion and the fact that preventive hygiene is the best preservation; whilst those who are already diseased ought to be taught that by a strict compliance with the teachings of hygiene they can greatly lessen their moral sufferings

and be permitted to enjoy the society of their fellowmen, and that if they follow these teachings there will be no necessity for isolating them from their friends and families.

These considerations induce us to give a negative answer to the question that serves as a title to this paper, if these leper asylums are given a free and voluntary character.

As this question is of vital importance and the above ideas can have no value without the approval of this learned Association, I beg to propose that it will appoint a committee from amongst its members to undertake a full investigation of leprous North America.

LEPROSY IN MINNESOTA.

By H. M. BRACKEN, M. D., Minneapolis, Minn.,

Professor of Materia Medica and Therapeutics, University of Minnesota; Secretary and Executive Officer of the Minnesota State Board of Health.

In Allbut's System of Medicine (Vol. III, p. 46), referring to the Norwegian lepers of Minnesota, Wisconsin and Dakota, it is stated that these have diminished from one hundred and sixty known cases to about a dozen. This statement is undoubtedly taken from the report of Dr. G. A. Hansen, of Bergen, Norway, 1888, who says, "Of about one hundred and sixty lepers who have immigrated into three states (Wisconsin, Iowa, Minnesota), thirteen are alive, whom I have seen myself, and perhaps three or four more. All the others are dead."[1] This statement refers to the *known* lepers that left Norway and settled in the Northwestern States. At another time, Dr. Hansen says: "The number of immigrated lepers from Norway is much greater than I had any idea of from the knowledge I could gather at home. My friends, Dr. Hoegh and Dr. Gronvold, have given me the names of many lepers here in America whom we did not know to be lepers when they left Norway." The figures quoted from Allbut's System therefore refer to those only who were known to be leprous when they left Norway, and are hence misleading as well as incorrect. In 1886, the Minnesota State Board of Health first reported upon the lepers of the state. An attempt has been made since that date, and I think with fair success, to keep a record of all the lepers in the state.

The table on next page will serve as an interesting text.

We have knowledge of fifty-one lepers having resided in Minnesota. Of these, seventeen had died before 1890. Of the thirty-four added to the records since 1890, eighteen were first reported upon in 1891, two in 1892, three in 1893, two in 1894, two in 1897, and seven in 1898 to date (September 15th). Little is known of the nationality of the seventeen who died before 1890, but from various reports it is safe to assume they were all from Norway. Of the later thirty-four, twenty-nine were probably from Norway and five from Sweden. Of the five from Sweden, one was reported first in 1894; the other four in 1898.

Of those who might have belonged to the one hundred and sixty *known* lepers that immigrated from Norway previous to 1888, this

[1] Ch. Gronvold, M. D., Report of July 1st, 1894.

No.	Nationality	Disease Appeared in Europe	DISEASE APPEARED AFTER COMING TO AMERICA													DATE OF		Age	Sex	Married or Single	No. of Children
			1 yr	2 yrs	3 yrs	4 yrs	5 yrs	6 yrs	7 yrs	8 yrs	9 yrs	10 yrs	11 yrs	12 yrs	13 yrs	Over 13 yrs	Birth	Death				
1	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1831	1880	.....	male	.....	
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	1822	1878	.....	male	.....	
3	.....	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1843	1878	.....	male	.....	
4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	1846	1876	.....	male	.....	
5	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1848	1878	.....	male	.....	
6	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1815	1877	.....	male	.....	
7	.....	yes?	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1848	1868	.....	male	.....	
8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	1825	1885	.....	male	.....	
9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	1854	1885	.....	female	.....	
10	.....	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	1839	1884	.....	male	.....	
11	.....	.....	.....	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	.....	1853	1886	.....	male	.....	
12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	bet. 1818-28	1888	.....	male	married	
13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	bet. 1848-58	1888	.....	male	.....	
14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	bet. 1829-39	1889	.....	male	married	
15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	bet. 1858-68	1889	.....	male	single	
16	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1849	1890	.....	male	married	
17	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1842	1890	.....	male	married	
18	Norwegian	.....	.....	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	.....	1816	1895	.....	male	married	5
19	Norwegian	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	yes	.....	1854	1892	.....	male	single	
20	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1830		68	male	married	1
21	Norwegian	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1840	1896	.....	male	single	
22	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1848	1896	.....	male	married	5
23	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1820		78	male	.....	
24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	20	1834		64	male	married	6
25	Norwegian	.....	.....	.....	.....	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	1857	1894	.....	male	married	3
26	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1838	189-	.....	male	married	2
27	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1840		58	female	married	6
28	Norwegian	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1843	1897	.....	male	married	3
29	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1864		34	male	.....	
30	Norwegian	yes?	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1850	189-	.....	male	married	some
31	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1850	1892	.....	female	married	
32	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	19	1826		72	male	single	
33	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17		189-	.....	female	married	4
34	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1871	189-	.....	female	single	1
35	Norwegian	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1851	189-	.....	male	single	
36	Norwegian	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16	1867		31	male	.....	
37	Norwegian	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1852		46	male	.....	
38	Norwegian	.....	.....	.....	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	1860		38	male	married	3
39	Norwegian	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1853	1897	.....	male	single	
40	.....	?	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1845	1894	.....	female	married	6
41	Swede.....	?	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1845	1897	.....	male	married	2
42	.....	.....	.....	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	.....	1860		38	male	.....	
43	Swede.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1865		33	female	married	4
44	Norwegian	.....	.....	.....	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	1867	1897	.....	male	.....	
45	Norwegian	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1843		55	male	single	
46	Swede.....	.....	.....	.....	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	1861		37	male	married	2
47	Swede.....	.....	.....	.....	.....	.....	.....	yes	.....	.....	.....	.....	.....	.....	.....	.....	1858		40	male	married	5
48	Norwegian	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1862	1890	.....	female	single	
49	Swede.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	yes	.....	1845		53	female	married	4
50	Norwegian	yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1863	1898	.....	male	married	1
51	Norwegian	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	yes	.....	1843		55	male	married	8

list cannot include more than seventeen. There is a possible total of twenty-nine cases in whom the disease first appeared in the old country, but it is not at all probable that more than twenty-two of these were included in Dr. Hansen's list of one hundred and sixty.

Undoubtedly some of those who have reported the disease as first appearing after they had landed in this country have not told the truth. It would be fair, probably, to say that twenty-five of the fifty-one Minnesota lepers had the disease before leaving Europe.

Twenty-one is probably the highest number of lepers known to have been living in Minnesota in any one year (1893). At present, thirteen are known to be living in the state. There may possibly be three more living, from whom we can secure no reports at present, and in addition, a few unrecorded cases.

Of these fifty-one known cases, but nine were females. Of the latest record (34 cases), twenty-one are known to have been married (15 men and 6 women), and twenty of these married lepers had children. It is quite possible that the other one (a woman) had children also. These twenty-one married lepers had from one to eight children. We have knowledge of at least seventy-eight children born to these lepers. It is not known how many of these children were born after the parent was recognized as leprous, but it is safe to say a large proportion of the seventy-eight. Not one of these seventy-eight children has become leprous, and in no case has the leper transmitted the disease to the companion in wedlock. Twenty of these fifty-one lepers are said to have the anæsthetic form of the disease; twenty-three the tubercular form; while for eight the type of disease is not given.

Of the thirteen lepers known to be living, I can give an outline of the present condition of but six, as follows:

No. 43. Mrs. D. Born in Nysaaken Varmlandslan, Sweden. There is no history of leprosy in her family. Her husband, a Norwegian, states that the newspapers have reported a case, or cases, of leprosy near her home in Sweden since she left there. She landed in America (Philadelphia), in 1887, and was married in the fall of the same year at Warren, Minn. The first symptoms of leprosy appeared soon after the birth of her second child in 1891. There was then swelling of the hands, feet and face. On March 24, 1898, inspection showed the following conditions: Hands and feet blue, nodular and swollen; face "leonine"; hair falling out rapidly; eyebrows gone; sore throat; anæsthetic spots on extremities and face. There are sores on her legs and arms received from blows and burns, due to the anæsthetic condition of those parts. She has four children; two born before the first symptoms of leprosy, two since. These are all healthy

and are aged respectively, 9, 6, 4 and 2 years. Patient is careful and cleanly in her habits. She burns all bandages used and has her own special towels, bedding, etc. She sleeps alone. The disease seems to be rapidly progressing.

No. 45. Mr. B. Born in Romsdal, Norway. Aged 55. He gives no history of leprosy in his family, but states that there were lepers near his native home. He landed in America (New York), in 1872. The first symptoms of leprosy appeared in 1874. These were anæsthesia in both hands preceded by severe pains. The ears are slightly nodular. The disease is not progressing rapidly. There is mutilation of the fingers. Patient is not married. His habits are good.

No. 46. Mr. E. Born in Vermland, Sweden. Aged 37. When twenty years of age (1861) he worked on a log drive in Sweden with Norwegians. There is no history of leprosy in his family. He came to America in 1884. Married in 1885 and has two children, aged respectively eleven and eight years, both in good health. In 1892, nodules first appeared on forehead and back. In 1893, face became involved. Disease progressing, but patient is still able to follow his occupation as a tailor. He is careful in his habits.

No. 47. Mr. L. Born in Helsingland, Sweden. Age 40. He knows of no leprous relations. He landed in America (Boston) in 1881. About 1888 anæsthesia appeared in the feet. Patient is married and has five children (girls), ranging from sixteen to eight years of age; all healthy.

No. 49. Mrs. P. Born in Vermland, Sweden (twenty-five miles from Stockholm). Age 53. She knows of no leprous relatives or neighbors. About twenty-five years ago she landed in America (Montreal). About twelve years ago she first noticed severe pains in lower limbs. At present, 1898, her hands, feet and face show marked evidence of the disease. She has had six children, four of whom are dead. The two living are aged about sixteen and twelve (both girls), and are healthy and rugged looking. The patient is not cleanly in her habits and if the family escapes infection it will not be due to any precautions taken by her. Her husband fears the disease, and this fear may lead him and his children to protect themselves so far as possible.

No. 51. Mr. J. Born in Norway. Aged 55. He has a brother in the leper hospital in Bergen, Norway. He came to America about twenty years ago and first noticed symptoms of the disease about seven years ago. He is married and has eight children, all healthy.

The history of these six cases gives some idea of the type of leprosy found in Minnesota. It is undoubtedly possible to find such cases wherever people from the Scandinavian Peninsula have settled in the

States or Canada. It is very difficult to secure a clear history of the course of this disease.

Let me draw your attention to a few facts emphasized by this table and these records.

1. The impression that leprous immigrants from the Scandinavian Peninsula are all from Norway is a wrong one. Five of eleven lepers placed on file by our Board during 1897 and 1898 are from Sweden.

2. The feeling that we can quarantine against lepers by watching immigrants is an unsafe one. The family history of all immigrants from a country where leprosy prevails should be secured before they are allowed to embark for America, and no member of a leprous family should be permitted to land upon our shores.

3. It would appear that the conditions antagonistic to the spread of leprosy in Minnesota are also opposed to sterility, as borne out by the families of several of our lepers. (Some of these have children, as shown by the following figures: 5, 5, 6, 6, 4, 6, 4, 5, 8.)

4. It is quite possible for leprosy to die out in certain favored sections of the countries, such as Minnesota, without segregation, *provided* the importation of lepers be discontinued.

5. Even in Minnesota, one has but to visit some of these lepers to feel that segregation *should* be insisted upon in all cases. One cannot but feel, on entering a filthy home and seeing a leprous mother careless in her habits, that the children are not safe.

6. Segregation in single States is not practical. It would tend simply to drive lepers from States enforcing such practice to those that were not carrying out the system.

7. A Federal home should be provided for these unfortunates. They could thus be cared for more economically and more satisfactorily than through any State provision.

8. In spite of all precautions that we may take, there will be some leprous individuals in this part of the world for many years to come.

9. The Scandinavian Peninsula does not furnish all leprous individuals found in the United States.

Finally, great care must be exercised in dealing with lepers in the future. That we have been constantly importing this disease is a recognized fact. That the chances of importing this disease will probably be increased, rather than decreased, unless great care is taken in dealing with infected countries, no one can doubt. All the lepers that come to America do not settle in the Northwestern States, and all sections of the country may not be so fortunate in affording such poor soil for the spread of the disease as does Minnesota.

It is altogether probable that there are some lepers in Minnesota that are not registered by the State Board of Health. Assuming that there may be a total of twenty lepers in Minnesota, it is a safe estimate, based on the United States census for 1890, of the Scandinavian foreign-born population, that there are at least twenty lepers in the four States, Wisconsin, Iowa, South Dakota and North Dakota, and probably one hundred and twenty Scandinavian lepers in other parts of the United States, making a probable total of one hundred and sixty Scandinavian lepers in the United States.

Basing our estimate on what is positively known to exist in Minnesota, the figures for the three divisions given would be, approximately, 13, 13, 78, or a total for the United States of one hundred and four Scandinavian lepers. If we base our estimates on the Norwegian foregn-born population in the United States, we should then have for the three districts a total of probably ninety-one Norwegian lepers.

REPORT OF COMMITTEE ON SANITATION, WITH SPECIAL REFERENCE TO DRAINAGE, PLUMBING AND VENTILATION OF PUBLIC AND PRIVATE BUILDINGS.

By Mr. J. W. HUGHES, Chairman, Montreal, P. Q.

From such information as has been obtainable from the large field covered by your committee, we are justified in reporting an increased interest in all matters relating to what may be termed practical sanitation, or the carrying out in actual work of the theories and plans of the advanced thinkers and experimenters in sanitary science. The work of our Association and kindred organizations, as well as the untiring efforts of individual sanitarians, in the past, has resulted in awakening an active inquiry and interest, and there is no longer heard the scoffing remark and sneering insinuation when an improvement is suggested that involves a pecuniary outlay. This is especially noticeable in the plumbing department of our work. We are of opinion that there is a tendency in some cases to rush from an extreme apathy and do-nothing policy to one of too great an elaboration and complication in the carrying out and planning of plumbing apparatus; safety, effectiveness, simplicity, are the requirements. Sewers, public and private, are to-day better constructed and more carefully planned than in the past, but the question of the best method for the disposal of sewage has yet to be solved and is becoming of more pressing importance every day. That our great towns, and other centers of population cannot continue to use the rivers and streams as public sewers, without serious danger to the public health, goes without saying. We are pleased to note an increased and practical interest in the question of the disposal of sewage by means of irrigation farms and other plans than that of running it into the streams.

The ventilation of public buildings is receiving the attention that its importance merits. The introduction of the power fan, combined with the development of cheap electrical force, has opened up a large field of possibilities. Whether the effectual ventilation of private buildings and dwellings will receive its solution from this source is a question. The greatest objection to the introduction of a system of ventilation into a private building that will at all approach the necessities of the case, especially in northern climates, is the greatly increased cost of fuel. Fresh air cannot be introduced, warmed and

expelled at the rate required, by an apparatus that will be even approximately effective, without a largely increased fuel bill. The question of effective and economical ventilation of dwellings is one presenting many difficulties and large profits to the inventor who can solve it.

THE INTERCEPTING TRAP ON PRIVATE SEWERS.

At the meeting of our Association held last year, a paper from my pen was read in which the fitting of the intercepting trap in private sewers was condemned, and reasons given for such condemnation. My study and observation during the time that has since elapsed has fully confirmed and strengthened the opinions then set forth; and I am indebted to an able paper by W. M. Watson, in a recent issue of "The Canadian Engineer" for results of a series of experiments bearing upon this question, conducted in the city of Cologne, Germany. The city fathers of that town, finding their by-laws which were up to date, and called for an elaborate system of back vents, intercepting traps, fresh-air inlets and the usual accompaniments, had not given the expected results, appointed a committee to investigate, and associated with it Herr Maniewski, the leading architect, and Herr Unna, the famed sanitary engineer. These gentlemen went thoroughly into the question, erected complete apparatus with glass pipes for practical demonstration, investigated the condition of existing apparatus in daily use, and, in short, gave the matter that careful and painstaking attention so characteristic of the German. Their report has been published in detail in No. 4 and 5 of the "Gesundheits Ingenieur" for 1898, and been republished in English papers. I can only give brief extracts taken from Mr. Watson's paper, bearing more particularly on the question of the intercepting trap, although the results of the experiments bearing upon the question of back vents are of equal importance, and may be taken up at a future time. "It was shown that when a main intercepting trap was used that it not only modified the speed and partly obstructed the flow of sewage, but it prevented any of the air carried down by the soil and other waste water pipes, from discharging into the street sewer, where its aerating functions are so necessary to commence the purification of the sewage in the drains and assisting in preventing sewer gases generating in the sewers. It was also shown that when the main interception trap is omitted there is a superior and self-cleansing flow of sewage and that large volumes of air pass forward to the street sewer, creating a healthy atmosphere, and circulation of air down the soil pipe through which the fluid is passing and up other soil pipes that are at the time standing idle. These experiments, especially those that show that air is carried down with waste waters and that the main

trap is a dangerous obstruction, fully explain the reasons why those towns that do not use back-air pipes, and that extend their soil pipes from the crown of the drains to the highest point of the roof, and which make every rain water leader and waste water pipe to pass to the street sewer without any obstructing trap or sharp angles or interceptions of any kind, are almost free from odors in the houses and streets and free from diseases that can be traced to sewer gas poisoning; while on the other hand those cities which have adopted the principal of interception traps, back-air ventilation pipes, with all their intricate complications, are often quite the reverse; and of disease a great deal is found among the inhabitants who happen to live in the modern-built houses, where the obstruction system has been installed, and this is in spite of the fact that the same towns often spend large sums of money in flushing drains and artificially ventilating the street sewers, a thing which is never necessary if the sewers are laid down properly and the straight, unobstructed system is adopted. The city of Cologne has now had enough of the complicated system of plumbing and draining, and in future will avoid such expensive luxuries, and again allow their sewerage water to leave inhabited premises with as much expedition as possible and secure all the aeration it can, through the journey to the outfall, without making itself a nuisance to the public.

"The Cologne investigation has bearing on sewage purification. It will be remembered more than twenty years ago Dr. Pasteur, of Paris, and Dr. Warrington, declared that sewage contained the necessary organisms for its own purification. Dibdin, of London, England, has shown us the way to compel sewage to clean and purify itself. Adney, of Dublin, has proved that domestic sewage requires three times its own bulk of air, regularly and evenly supplied, and distributed to every particle or atom of the sewage, to enable the friendly bacteria to destroy the poison, etc., the sewage contains. Lowcock, Birmingham, has shown us a method of applying the atmospheric air to the sewage, and Reid, of Staffordshire, recommends that all sewage should be purified while fresh, before putrefaction sets in or sewer gas begins to generate. The fathers of Cologne have shown us, by their experiments, that the sewage will split up with fine threads and spray and take up atmospheric air in larger quantities even than Adney tells us is needed during the time it is falling vertically down the waste pipes. If every house rain water leader and waste water pipe were made to form a street sewer ventilator, and the water coming down each of the pipes will bring down four times its own bulk of air, which will go a long way towards providing all the air that is needed to do the necessary work of clean-

ing the sewage, and in that case the public sewers will be changed from a gas generating chamber to a receptacle for the areation and purification of sewage, and in that case they would be harmless. While under obstructive plumbing by-laws and private drain arrangement of interception traps, no aeration of the sewers can take place, therefore purification lets up and the sewage gas is generated abundantly, which poisons the dwellings and the atmosphere of densely populated towns. The Cologne investigation has demonstrated that most sanitary appliances can and ought to be made of glass."

I have quoted so copiously from Mr. Watson's paper, as he has put the matter much better than I could, in confirmation of the objections I gave against the intercepting trap in last year's paper.

ILLUMINATING GAS MORE DANGEROUS TO HEALTH THAN SEWER GAS.

By SAMUEL H. DURGIN, M. D., Health Commissioner, Boston, Mass.

The object of this brief paper is to call the attention of the Association to a subject which the writer thinks may not have received the attention which its importance deserves at our hands.

I refer to the danger to health from illuminating gas and the need of wholesome regulations and careful inspection to secure better construction and repairs for gas pipes and gas fixtures.

We cannot remember the time when the popular mind did not regard sewer gas as one of the great foes of the human race, or when health officers did not exercise the functions of their office as if they believed the same thing. So strong and general has this impression become that it has not been difficult to obtain legislation for greatly improved materials and workmanship in plumbing to guard our dwellings against the possibilities of sewer gas, or to secure convictions in court where landlords have allowed defective drainage and plumbing to be suspiciously associated with sickness of various kinds.

We do not wholly deplore the popular fear of sewer gas, which aids the health officer so much in securing the atmospheric purity which belongs to good plumbing and draining; we do not ignore the fact that sewer gas produces a measure of pollution of the atmosphere, but we must acknowledge that there is no scientific basis for regarding it as an active poison or a source of serious danger to human life.

On the other hand, it must be said, without hesitation, that illuminating gas contains a most active and deadly poison; that it is frequently held, under a pressure of about two pounds to the square inch, in flimsy and defective pipes and fittings, and from which it escapes into our dwellings much more frequently than it is possible for sewer gas to escape. No deaths are reported from sewer gas, but many are reported as caused by illuminating gas, and the number of the latter is increasing. The deaths from this cause in Boston during the last five years have been as follows:

1893	25
1894	33
1895	28
1896	40
1897	43

Such deaths are reported only when a considerable quantity of the gas is known to have been present and its action so rapid as to have left no doubt as to the cause and effect. That innumerable cases of slow poisoning, with the attendant disturbances of health and comfort, do occur, is known by the medical profession, but such cases do not appear upon the public records. The addition of water gas, giving us from twenty-five to thirty per cent. of carbonic oxide, is an added danger, but not the only cause for alarm. I believe that we should maintain that even with simple coal gas, or when the amount of carbonic oxide is kept down to ten per cent., the danger to health would even then be too great with the many small leaks in the gas pipes and fittings to excuse the health officer in not giving at least as much attention to gas pipes and fixtures as is now given to plumbing and drain pipes. In 1897 an act of the Legislature of Massachusetts was obtained which requires all persons who desire to engage in or work at the business of gas-fitting in the city of Boston, either as an employer or journeyman, to be examined by a board established for the purpose, and if found to be competent, to receive a license as a master or journeyman gas-fitter. The act authorized the Boston Board of Health and building commissioner to make and enforce regulations for all materials used and work performed in gas-piping and gas-fitting, provided for the appointment of a corps of inspectors, who examine for approval all new work in construction and repairs, authorized the Board of Health to inspect the gas fixtures and appliances in any building and to make such requirements relating thereto as it might deem the public health required and to compel the owner of such building to comply with such requirements.

The Board of Health, after overcoming the ordinary difficulties incident to an innovation of this kind, began the examination of gas fixtures and appliances in houses in Boston in October, 1897, and has examined a sufficient number to warrant the statement that the leaks in gas fixtures and pipes are very numerous. It was thought best in beginning the work to take a block of houses here and there which would represent the new and costly, the poor and the medium classes of dwellings, and see what the average condition of the gas pipes and gas fixtures in the city might be. This was done and resulted in finding eighty-nine per cent. of the houses showing gas leaks from two to eleven in number. The method used for testing is by disconnecting the supply pipe from the house side of the meter, plugging the opening and applying the pump to the nearest bracket and producing a mercury displacement of two inches which must stand five minutes without change. This pressure is somewhat greater than that of the

gas in the pipes, but is no greater than all sound and trustworthy pipes and fixtures should bear without leaking. The examination of gas pipes and fixtures and the efforts to prevent illuminating gas leaks will be continued with us hereafter as vigorously as we have pursued sewer gas leaks in the past.

ON THE WORKING OF THE FOOD AND DRUG ADULTERATION ACT IN CANADA.

By F. X. VALADE, M. D., Analyst, Ottawa, Ont.

Mr. President and Gentlemen—During this last century science has made gigantic strides in the direction of progress. The world has been astonished at the wonderful discoveries of an Edison and scientific men have rejoiced at the admirable accomplishments of the illustrious Pasteur. Every now and then new beams of light disperse the shades of our ignorance and new mysteries are unveiled to our astonished eyes. Such a craving seems to have taken hold of every intelligent man that he desires to know every phenomenon and its explanation.

Physicians whose duty it was to cure diseases when they occurred are now applying themselves to more than curing diseases already afflicting mankind by their endeavors to prevent the occurrence of such diseases. As a result of their intelligent investigations they have reached the conclusion that some of the diseases are caused by the carelessness of individuals in their domestic life and their neglect of the proper precautions in selecting articles of food and drugs.

The theory of microbes as the cause of diseases being now admitted as an established fact, attention is directed to their mode of conveyance through the organism. On serious examination food and drugs were found to be the general channel through which those microscopical beings migrate to the organism, where they implant themselves, grow and multiply with prodigious rapidity to the great discomfort of the individuals so infected.

These discoveries being made public the State, that great and accredited supervisor of public interests, took the matter in hand and enacted laws for the good of the community.

In the United Kingdom these laws are very numerous and almost every year new laws regulating public health are promulgated.

Always awake to the progress of science, the statesmen of Canada have not neglected this most important question of public health. Boards of health were established in every city, to the great relief of the alarmed citizens. Boards of health, however, were soon found not to be sufficient to cope effectively with the evil, and it was deemed necessary to legislate for the proper inspection of the food and drugs consumed by the public, and the result was the promulgation of the

law called "An Act Respecting the Adulteration of Food, Drugs and Agricultural Fertilizers."

The last clause, introducing the agricultural fertilizers, was inserted to meet the desire of the farmers of this country, who constitute the majority of our population. The proper inspection of agricultural fertilizers is of paramount importance in this essentially agricultural country, and the legislators, in their solicitude for the proper discharge of their duties, have inserted this clause for the purpose.

The act provides for the appointment of competent district analytical chemists, who are entrusted with their share of the administration of the Adulteration Act.

There are, actually, in the Dominion, eight district analysts, one in each of the cities of Halifax, St. John, Quebec, Montreal, Ottawa, Toronto, London and Winnipeg. Lately a new district was created by the appointment of an analyst in the rapidly progressing province of British Columbia. Owing to some difficulty of installation, the laboratory is not yet in good working order, but it is to be hoped that soon all the necessary arrangements will be completed and beneficial work accomplished.

The persons appointed are professional men, of course, and are prepared to do all the analytical work the public has to offer them.

Now that the branch is in good working order, to insure the full competency of those nominated to discharge the duties of public analysts, a board of examiners has been appointed to testify to the ability and chemical acquirements of those desiring to become public analysts. Only those who have duly qualified themselves before this board are eligible to the post of district analyst. In this way favoritism is excluded from the appointment of the officials and the public is perfectly secured against incompetent persons.

In order that the appointed public analysts might take their part in carrying out the Adulteration Act, they are supplied, from time to time in the course of the year, with a certain number of samples to analyze. These samples are collected by food inspectors, of whom there are as many as there are analysts—that is, one for each district. Besides the dictrict analysts the act also provides for the appointment of a chief analyst and a few assistants, who are to help him in his endeavors to have the food inspection properly done. Our present chief analyst we have the pleasure of having with us to-night, in person of the secretary of this convention. Mr. MacFarlane and his able assistants constitute what we might call the staff of the Dominion laboratory. Their duty consists in checking the results of analyses of the different district analysts and acting as referee in the occurrence of any dispute between the vendor and the district analysts

The vendor can always appeal to the chief analyst, against the decision of the district analyst, and the decision of the chief is final in every case.

The instructions received by the food inspectors are issued by the central laboratory branch after the Commissioner of Inland Revenue has been consulted as to what articles should be analyzed. Orders are issued to the food inspectors to collect so many samples of food, drugs, some, perhaps, of a particular kind and to deliver them to the public analysts. The food inspectors go into the shops and places of business and ask, as if they were ordinary purchasers, for the articles in question. According to the law and according to the practice in Canada, the vendor is then and there, after the purchase has been made, informed of the purpose for which the sample was obtained. The sample is then divided into three parts, each sealed up, one left with the vendor, one sent to the district analyst, and the remaining one to the departmental laboratory at Ottawa.

The next step is the analysis by the district analyst of the sample and his report to the Commissioner of Inland Revenue. The analyst is paid certain fees on the delivery of his certificate showing whether it is or is not adulterated.

The certificates are then inspected by the chief and the results placed on record in the books kept by the branch at Ottawa, which are properly systematized. The chief, with the aid of the laboratory staff, is usually able to go through all the samples analyzed by the district analysts and check their results, but as a rule only those found by them to be adulterated are considered to be worth revision in this way. In such cases the samples sent to Ottawa are analyzed in the laboratory there and if the results obtained by the local analysts are confirmed, the next proceeding is to apply the act, carrying out its provisions in proper order. Of course, certain cases can be reported at once to the Department of Justice for prosecution, but the act gives the Minister of Inland Revenue the power of previously intimating to the vendor that his sample has been found to be adulterated; and he has also the power, under the act, of calling upon him to pay the cost of collecting and analyzing the sample, which cost varies from eight to sixteen dollars. The vendor can elect to pay the fine or to refuse and stand a prosecution.

In addition to such legal proceedings, bulletins are published in which the names and addresses of persons from whom samples have been obtained are given, and also the results of the examinations, both of the genuine and the adulterated articles. The publication of these bulletins is quite anxiously looked for by the public, and the press readily takes notice of them. The local newspapers and periodicals are sure to publish the names of the individuals in their neigh-

borhood who have been found to sell adulterated goods; so that it may be said that by these publications alone the branch has done, and is doing, a great deal of good towards the improvement in the quality of the articles sold throughout the whole Dominion.

In the daily discharge of my duties as public analyst, I have oftentimes been the object of severe attacks from the persons found guilty of selling adulterated goods. These persons complained of being harnessed with the whole responsibility, while, as a matter of fact, they were altogether unaware of the sample being adulterated. To such complaints I found a ready answer in the act itself, article 23, No. 2, where it is said: "If the person accused proves to the court before which the case is tried that he did not know of the article being adulterated, and shows that he could not, with reasonable diligence, have obtained that knowledge, he shall be subject only to the liability of forfeiture; that is, that he will be deprived of the possession of all those adulterated articles which may have been found on his premises." By this article the legislators have made sure that the individuals are not unjustly molested in their business transactions.

Having thus far explained, in as few words as possible, the scheme adopted in the Dominion of Canada for the proper administration of the Adulteration Act, I believe it will not be out of place here to show you, by a few considerations, the importance of the work of public analyst.

One of the first articles of food submitted for examination to public analysts is milk. The chief analyst has devoted special attention to the inspection of milk, both on account of its importance as a food and the frequency of its adulteration.

Milk is peculiarly adapted for use as a food by man for several reasons. It contains all of the four classes of nutrients: protein, fats, carbohydrates and mineral matter, in more nearly the proper proportion to serve as a complete food than any other food material, although no one substance can furnish a complete food for an adult. It is in a form well adapted for varied uses, either alone or more especially in combination with other food substances and in the preparation of various dishes for the table. Milk is considered one of the most economical articles of food and is used universally, hence its great importance from a public health standpoint. By its means diseases are spread with alarming rapidity and its bad quality causes diseases innumerable. Especially amongst children is adulterated milk showing its nefarious action. The digestive power of a child is very limited, and only very digestible foods can be introduced safely into its stomach, and these in proper proportions. If some of the

constituents are abstracted or the balance of their proportions disturbed by the addition of water, grave consequences follow, resulting sometimes in the death of the child. The laboratory branch, by preventing such adulteration, is doing a most meritorious action, for which the consuming public must be thankful.

Another pernicious enemy whom the analyst always finds on his way is *lead*. Unhappily lead is called upon to play a great role in domestic economy, and it is one of those slow but effective poisons with which we are always in contact. No notice is taken of its presence, but it does its work, undermines the most vigorous organisms and produces irretrievable injuries. But where is it found, do you ask me? Everywhere, I say; in the vessels employed in cooking our meals or for preserving our food, which thus gets seriously contaminated; it even finds its way into that greatly used article of toilet called *rouge*, of which old girls are so fond. Applied in this way, lead is easily absorbed by the pores of the skin and lead palsy is the inevitable result. Vessels coated with oxide of lead should never be used, as they are easily corroded by the acid juices, and the lead thus rendered assimilable.

In the course of my analytical work I have been called upon to analyze samples of carbonated waters. Several of these samples were contained in bottles secured with the so-called automatic patent stoppers, so much in use in Ottawa. This stopper is made out of an alloy of about equal parts of lead and tin. A piece of this alloy is fitted up with a rim of rubber, which presses against the neck of the bottle, thus preventing the gas from escaping. In order to open the bottle one has only to press down the stopper. It is a very convenient scheme, but a most dangerous one. The carbonic acid acts upon the exposed part of the stopper, corrodes it, transforms the metallic lead into bicarbonate of lead, which thus becomes soluble and is absorbed by the unsuspecting client who is quenching his thirst. Sufficient quantity of lead has been found by me in these samples to warrant the condemnation of such scheme for bottling aerated waters.

If I wanted to mention each of the most shameful and dangerous adulterations detected and prevented as much as possible by district analysts, I would occupy too much of your time. You are quite aware to what an extent adulteration is carried on all over the world. Competition in commerce and the desire to sell articles at as low a price as possible, with as large a profit as is available, may be taken as the first cause of the wholesale adulteration of food and drugs. As an example of the different kinds of adulteration prevailing, let me just state the following, taken at random, here and there:

Coffee is largely sophisticated in Hamburg, Antwerp and Rotterdam by the process of washing, coloring and drying off in centrifugal machines with sawdust; the furrows of the berries become filled with wood powder, making them a fine white.

A rich color is imparted to weak milk by annatto, saffron, turmeric and marigold flowers. Then saffron is adulterated with coal tar derivatives which closely imitate the color of pure saffron, so we have to look for this coal tar color in milk; next, this coal tar color is itself adulterated with about seventy-five per cent. of sodium chloride, and here the chain ends, for salt is too cheap to require adulteration.

Cayenne is sometimes too hot; red ochre, venetian red or brick dust corrects that, and a little salt to make it tasty completes the thing.

Lately a merchant mixed some honey with sugar and brought it to me for examination, because he thought "them analysts wern't much good;" glucose was found in it, so, just as he thought, "they wern't no good;" but he admitted to having used syrup instead of crystallized sugar and his syrup was adulterated for him first with glucose.

Cocoa husks are not wasted; they somehow get into our powdered *pimento*, and as they contain spiral fibres, often in the form of open rings, they look well under the microscope; of course, it is necessary to roast the husks for the sake of color.

Oleomargarine is too white; its substitution for butter might not be a success; so a little annatto was used to get over the trouble, but this was soon found out, and now azo-dyes replace the annatto; a little orange dye may be added, also, with beneficial results.

When a sample of rhubarb root yields a dull, uninviting powder, a little turmeric put into the mill and ground up with it brightens the powder wonderfully and makes one almost willing to swallow a Gregory's powder; this is not, however, a new game, and in the good old days when analysts were few and not such nuisances as they are now, there used to be a regular system of drug adulteration carried on by grinders—*e. g.*, after grinding a quantity of ipicacuanha, a light-colored sawdust was added, because it best gathered the drug from the cuttings in the mill stones and cleaned them perfectly; and of course, after grinding cinchona the only sawdust of any use for cleaning the stones was that of rose wood or mahognay. I believe that nothing of the kind is practiced now, but I have a sample of pepper which contains six pepper corns in one-fourth ounce, the rest is hay seeds and buckwheat.

The hunters of the musk deer often open the sacs and put in small bullets, stones or bits of metal and brown earth. A friend of mine once received a dozen sacs from New York, some of which were

stuffed with bits of printed paper, scraps of the *New York Tribune* and *Herald*. A Thibet deer could not well deposit those naturally, so we wrote a remonstrance to the New York dealer and received from him a most indignant reply: "The sacs he sent us could not possibly be fraudulently filled, because he had filled them himself."

These few examples of wholesale adulteration are sufficient, I trust, to give you a bird's-eye view of the immense field opened to the conscientious analyst, and I feel assured that each and every one of the analysts is alive to the necessity of putting all his good will and energy to the effective administration of the Adulteration Act.

ROUGH NOTES ON THE ETIOLOGY OF TYPHUS FEVER.

By J. BRENA, M. D., Zacatecas, Mexico.

Ce n'est pas aimer la verité que de ne l'aimer que
flattense et agreáble ; il faut l'aimer âpre et dure,
affligeante et sevère : il faut en aimer les epines et les blessures.
[Montaigne.]

To be of use to science, to contribute towards the practice of art and to comply with a patriotic duty, such has been the manifold and powerful motive which has induced me to appear before this learned Association, although I am fully conscious of my intellectual unfitness and the small value of the knowledge acquired during the course of my experience.

In presenting in this paper, some of the results of my observations, I have borne in mind that the chief object of such meetings as the present is the prevention of disease by the improvement of sanitary legislation; and that such an important matter covers the field of all medical knowledge and derives its main value from the fact of there not being excluded any branch of the healing art, since each and all, in their respective spheres, supply elements which serve for the laying down of rules, prohibitions or precepts of the vastest importance for the preservation of human life.

It is so well known and established by experience that it is scarcely worth while to point out the importance of a knowledge of the various features presented by diseases in their existence, progress, termination, etc., according to the localities in which they are treated; and this applies not only to regions endowed with diverse climatic conditions from their different geographical situations, but also to those lying in the same zone and with similar climates, always provided that the temperature or some special feature exerts a peculiar influence on organic beings, according to the elevation above sea level, exposure, local conditions or other physical circumstances.

It is also an undeniable fact that the comparative study of the treatment of diseases in different cases and places offers, amongst other advantages, the following:

First, that of being able to distinguish accurately the morbid type with those constant and unchanging phenomena which constitute its essence, from the symptoms which, owing to the variety in the way of presenting themselves, or to the fact of their disappearance in accord-

ance with accompanying circumstances, may be termed accessory and contingent upon local influences; and, second, that of throwing a considerable amount of light on the etiology. If we have admitted that a certain complaint be caused by a certain circumstance which is common in one country and non-existent in another equally afflicted by the complaint in question, simple common sense is sufficient to point out that we are in error as regards the predisposing cause, and, *vice versa,* if here we consider as incapable of causing disease what in other countries is followed by definite pathological manifestations, we shall be forced to include the phenomenon in question amongst the predisposing causes of the disease.

I need not here insist on the importance of the full justification of the rules and prohibitions which are required to conciliate two important interests which for many generations have been in conflict, namely, the commercial relations which exact ample liberty and the protection of the public health; and I say so because I am speaking in a country which, with admirable prudence, has solved many problems relating to sanitary legislation, substituting for the old, obsolete and oppressive system, a medical and rational inspection in harmony with the progress of science, and one which does not interfere with commercial traffic, the interests of which are opposed more in appearance than in reality to what tends to lessen or to avoid the disasters caused by contagious diseases.

One of the most alarming and deadly causes of destruction in several parts of our continent is the spotted typhus, which is identical with that which prevails in England, several parts of Europe, and which was principally originated in Ireland. The prevention of this scourge, and the best ways of extinguishing or diminishing its ravages, have justly occupied the attention of governments and formed the subject of papers read before this Association. I propose to say a few words on the same subject, seeing that I practice the medical profession in a locality which has suffered to a large extent from the evil in question.

The epidemics which I have studied have been remarkable, amongst other circumstances, for their having suggested ideas respecting the production, propagation and extinction of the disease which are at variance with some which have been propounded and accepted with a certain amount of favor during the last few years by several medical men and hygienists. The works which treated of this subject some years ago assigned as the principal cause of typhus the vitiation of the atmosphere from the agglomeration of people in badly ventilated places, recognizing as assistant causes of importance the want of cleanliness, insufficient food or food of bad quality, fatigue, moral depression, etc.

Modern observers, not satisfied with these generalities, have tried to determine a more ostensible influence and one independent of circumstances, which tend to hide the real power of the poisonous action, and some have arrived at the conclusion that the emanations resulting from organic substances in a state of decomposition, and especially the mephitic gases arising from the stagnation of fecal matter in privies, are the principal source from which arise typhus exanthemata. It is well known that this theory was first propounded by Murchison, and although the arguments adduced by H. Bennett in refutation of it in 1873 are unanswerable, it has met with a certain amount of acceptance in our time.

I am unable to show any facts in support of that view of the case which has been strenuously defended by some observers. The conclusions to be arrived at from the epidemics which I have seen tend, on the contrary, if not to completely refute the theory of the poisonous action productive of the fever being due to the cause mentioned, at least to raise doubts which demand investigation in order to clear them up, and a prudent limitation in trusting to the sanitary regulations issued as preventives against typhus and which consist in the purification of privies and drains issuing from them. With the brevity required by the statutes of the Association, I will mention the circumstances which support the assertion which I have made, calling attention to the fact that any one who may so desire may verify them by means of numerical and official data preserved in the archives of my State, which data I do not quote for the sake of being concise.

What in large cities has to be made by the hand of man at a great cost, namely, a central drain for the concentration of excrementitious matter, in order to have it taken outside of the city precincts, exists in Zacatecas, made by nature, and consists in an "arroyo" (river bed), the average width of which is about 10 m. When I say that this "arroyo" passes through the city, it is understood that a great many dwelling houses of all classes are situated close to it, some, in fact, being built on arches which cover it. Filth of all kinds, but more especially human excrement, remains deposited in the bottom of the "arroyo," and only disappears partially when the higher part receives a sufficient quantity of rainwater to wash it away. As the rains in our climate are, generally speaking, scanty and of short duration, the city is seldom to be found totally, or even to a great extent, exempt from the emanations exhaled from this place. On the contrary, during some years the rainy season is so short and even almost non-existent, that the mephitic substances remain undiminished and even increased by the constant additions. Many of the poorer dwelling houses have no water-closets, and the inhabitants go daily to a considerable dis-

tance from their homes to relieve nature, for which reason those houses never contain excrementitious matter.

Furthermore, there are houses which contain privies that have such an abominable stench that this fact alone proves the bad construction of the drain which, after a more or less sinuous track, and without the progressive declivity necessary to insure the passage of the contents, runs into the "arroyo." With few exceptions, the sewers are to be found during almost the whole year stuffed with their contents, as only when some specially heavy rain favors us are those contents washed away and the atmosphere of the dwellings left free from their emanations.

If the first class of dwellings which we have mentioned, putting aside the disadvantages consequent on the poverty which prevents the most modest degree of comfort, can be said to fulfil certain conditions of hygiene, since they are free from excrementitious effluvia, the last class represents the most disadvantageous type of dwellings.

Any one who accepts as true the doctrine that the generative cause of typhus is to be found in the presence in the air that is breathed of gases emanating from human feces must assert that the disease prevails constantly and endemically wherever the conditions mentioned above exist, and yet I must at once state that such is not shown to be the case by observation of the facts.

I have witnessed three epidemics of typhus. I will treat of them in a cursory manner and only as regards the peculiarities that bear on the etiology of the disease.

The first began in August of 1878 and lasted about six months, ending in March of 1879.

It is precisely towards August or September when the rains of June or July are coming to an end that the "arroyo" is to be found completely clean and the drains of the private houses free from the excrement of inhabitants. The public health of the city also reaches its best point every year about the end of October, so much so that the medical men find their work considerably lessened at this season. The official statistics of deaths give an annual rate of nearly 3,000 for a population of 38,600 inhabitants. The daily average is thus found to be eight deaths, and it can be proved that, if during the months of May, June and July, the rate reaches 10, 12, 14 and even 20 daily, about October it decreases to 4, 3, or even none at all. It was, therefore, remarkable that the first cases of typhus having made their appearance, as I have said, in August, 1878, they should reach their maximum in numbers and virulence in October and November, decreasing thenceforth gradually until they disappeared altogether in March of the following year.

It was also noticed then, as well as in the subsequent epidemics, that, though very virulent cases occurred amongst families whose houses were close to the "arroyo," or presented other defects, such families were not attacked more than others, as some families, in spite of the bad sanitary surroundings, escaped the contagion, whilst, on the other hand, the disease made ravages in districts far removed from the "arroyo." The same can be said respecting the second epidemic of typhus, which began in 1884 and ended in 1886.

Those years were exceptionally plentiful in rain, and, in their course, several times the bed of the central "arroyo," as well as the feeders, were left, if not completely clean, at least to a great extent free from filth, yet there was no apparent diminution of the number of cases due to the absence of fecal effluvia, nor was there a corresponding increase in the number of cases when there was an accumulation of filth, the fever having ceased entirely, evidently through the influence of unknown phenomena, and not that of the circumstances already explained.

In the last and most terrible epidemic known in Zacatecas, the first cases appeared in January, 1892, and the last in May, 1893. It is true that in these last years there was an almost total want of rain, to such an extent that the crops were lost and a great number of cattle died in the fields from thirst and want of pasturage, but almost the same thing had happened three or four years previously, and yet during those years no epidemic manifestation of typhus was seen.

The same drought continued with little variation during 1894 and 1895, and yet the pestilence came completely to a close in May, 1893, that is to say, at a time when not only had the city not been flooded, but when the rainy season was only beginning.

Furthermore, during those several epidemics, the disease has not been confined to the State nor to the city of Zacatecas, as was to have been expected if it had depended upon local conditions, nor has it been seen that, having made its first appearance amongst the inhabitants of the capital of the State, it spread successively to other points, proportionately to the commercial relations existing.

It was evident that the typhus of 1892, though it claimed a great number of victims in Zacatecas, did the same almost simultaneously in distant cities, such as San Luis Potosi, Guadalajara, etc.

Cases of the disease occurred in the same year in New York and even in Europe, principally in the *banlieu* in Paris.

From the point of view of the diffusive power of the typhus virus, whatever it may be, there were some remarkable peculiarities observed. In the first-named epidemic only one doctor fell a victim to the contagion; in the second, although it lasted four times as long, not

one died, while in the last fifty per cent. of those of us who were practicing were carried off; in Jerez one of the three who were in that place, and in Villanueva the only one who was established there.

These misfortunes, like many more of which the history of the typhus epidemics is full, show clearly the paramount necessity of isolating those who are attacked, as a best guarantee for the communities. The surprising facts which I am about to mention in no way conflict with justification of isolation and, at the most, indicate the variability of the communicative power of the virus, during the course of the epidemic or the concomitance of action of the generating cause with the contagion of the disease. Thus, during the typhus of 1892, not only was the capital of Zacatecas attacked, but also towns which have more or less business traffic with it, and even others like Aguascalientes, in spite of the Government of that place having endeavored to protect it by means of a sort of quarantine. But it was particularly noticeable that places very near Zacatecas, like Ojocaliente, which has constant communication with the State capital and is connected with it by two railways, should have been entirely exempt from the calamity. The stamping out of the typhus in that same epidemic contains a lesson of no small value for an impartial observer.

When the great number of fatal cases and the reports of the doctors made it apparent that we were in the midst of a general pestilence, there being in the State of Zacatecas no permanent Council of Public Health, a provisional board of physicians was named to take the steps that might seem most adequate to combat the epidemic. The principal and, doubtless, the most efficacious of the steps taken by the board was the establishment of a lazaretto some kilometers from the city, and an order was given that all the people attacked should be taken there. But it happened that the charity to which private individuals were moved at the instance of the Government, instead of being employed for upholding the orders of the medical board, rendered them quite useless by sending doctors and medicines to the indigent patients at their own houses, while the people of better means continued to be cared for in the heart of the city, so that the lazaretto was occupied by a very small number of patients compared to the total number of cases.

Thus, not only was recourse not had on this occasion to the most efficacious methods prescribed by modern science in such melancholy circumstances, but everything was done that tended to the indefinite prolongation and fostering of the baneful influence. Many patients passed through the whole period of the fever in unhealthy, ill-ventilated and close lodgings along with their families, receiving the visits of their friends, and without any further precaution for them and

their neighbours than one or two truly ridiculous precautions, such as sprays of phenic acid and water, and such like. As soon as the patient was fortunate enough to get through the disease, he used to leave the house as soon as he was strong enough to do so and go about the streets mixing with the rest of the people. If the patient died, the family always found some means of evading the vigilance of the police, in order to keep on living in the same infected quarters and making use of the same clothing and bed as those of the patient. All of us who, during that unhappy time, condemned indignantly this manner of succoring the poor as highly censurable and dangerous to the majority of the population, as also the fact that the authorities should permit it, expected only the indefinite continuance of the epidemic, with all its terrible consequences, and, notwithstanding, against all reasonable expectation, it went on decreasing, until it ceased altogether in May, 1893. There are other facts which demonstrate the difference of the strength of the deleterious agent of the complaint in the different epidemics. For example, during the prolonged epidemic of 1884 to 1886, very few people of under twelve years of age were attacked, and the mortality occurred chiefly amongst adults and old people. In the epidemic of 1878 there were some cases amongst children under the age mentioned, but very few deaths, whilst, in the disastrous period of 1892 to 1893, children of less than five years of age were attacked and succumbed with ataxic symptoms. I must add that there being invariably a defective state of the "arroyo" and privies, as I have said before, seeing that the scarcity of water is so great at certain periods of the year, that the quantity requisite for drinking and domestic purposes has to be brought in large tanks by the Central Railway from great distances, yet spotted typhus is not constantly to be met with in Zacatecas. We generally do not see a single case in the intervals between the great and prolonged epidemics; now and then an isolated case occurs, but of a mild form and not easily communicable to those attending the patient.

On many occasions the attention of the public has been called to cases of typhus or typhoid fever in localities in which the people have been exposed to fecal emanations, from which fact a direct influence has been presumed in the production of the disease from the fermentation of such substances.

Only a short time ago (July 21), Doctor Biggar, at a meeting of the Public Health Committee of the Belfast Corporation, attributed several cases of typhoid fever "to the eating of shell-fish gathered on the odoriferous banks of Belfast Lough, which are saturated with sewage matter." Examined superficially, such observations would seem to establish a connection between the complaint and the circumstances in

which it has made its appearance. Nevertheless a strict and comparative inquiry into facts which are diametrically opposed, that is to say, those in which collections of human beings, sometimes permanently and at other times for periods sufficiently long for the manifestation of the effects of any agent calculated to cause disease, have been submitted, not only to the respiratory absorption of fecal gases, but to the manual manipulation of the filth, without there having been a single case amongst them of either typhus or dysentery, leads us, in spite of ourselves, to completely discard the belief in the influences which we have wished to attribute to circumstances, which, as regards the facts accepted as demonstration of the fecal origin of typhus, play no other rôle than that of mere coincidences. Thus, for example, the building in which the Zacatecas prison is contained, amongst other anti-hygienic conditions, has that of being too small to contain nine hundred persons, which is the average number of occupants. The cells in which the prisoners pass the night and part of the day are small, tainted and, in some cases, so close to the sewers that the atmospheric air, already vitiated by the agglomeration of people, is, so to speak, saturated with deleterious principles, over and above those which emanate from the collection of excrement. One would suppose that, under such insalubrious conditions, prison fever would be endemic in the prison of Zacatecas, and yet, not only do periods of five years pass without there being a single case in the establishment, but, during the most severe and prolonged epidemics, the typhus virus did not select the prisoners preferentially for the exercise of its terrible effects, who, in some of the epidemics, escaped altogether.

It is well known that there existed formerly in the outskirts of Paris (Montfaucon), an establishment which supplied the agriculturists with a kind of manure called "poudrette," which was nothing else than excrement solidified by evaporation. The stench which arose from this place was insufferable to those who were not accustomed to it, while those who lived there and those who were employed in the establishment seemed scarcely to perceive it, and were not attacked by epidemics more than other people who lived in other parts of the city. The meadows of Craigentinny, near Edinburgh, were never conspicuous for unhealthiness, yet for more than two hundred years they have been fertilized by the contents of the sewerage of the city (Bennett). In 1858 the tainted odor arising from the Thames was remarkable without there having been, on this account, a worse sanitary condition in London than at other periods, etc.

Instances of this kind are plentiful and they have, doubtless, more weight in the demonstration of the fact of the absence of the cause of the generation of typhus fever in the emanations mentioned than those

other facts which have been stated in support of their influence, seeing that the influence cannot be studied by itself, to the exclusion of a thousand other conditions present in the environments or in the organism affected, which contribute in an unknown proportion to the production of the poisoning. Obliged, as I am, to be brief, I have not been able to dwell at length and in detail on the defects which we lament in Zacatecas as regards salubrity, which are constant and from which we might reasonably infer the constant presence of typhus among its inhabitants.

For the same reason I abstain from giving a detailed account of the several epidemics of the complaint and will merely touch on the points which I consider corroborative of my conclusions. There will not be found in this paper any direct impulse towards the progress of the science that deals with the public health.

Men who are striving after the attainment of that supreme ideal will not find in my words more than an insistence on the necessity of making new investigations, and not the incentive inherent in carrying out of improvements, in the attainment of triumphs nor in the fruitful excursions into the realms of the unknown.

I offer to the consideration of the audience well proved facts, as all of those which have reference to medical observation have some interest, whatever their genuine interpretation may be, and principally when they corroborate or destroy important theories, such as those which deal with the genesis or propagation of disease.

In fact, sanitary laws, which are always more or less onerous to individuals, and are only tolerated as a sacrifice to the common good, have to deal mainly with the different ideas entertained concerning the causes and spread of contagious diseases.

Innovations and discoveries regarding such an important and difficult matter as the preservation of public or private health deserve applause and honor of every kind. I merely crave the indulgence of the Association while I demonstrate that one of the most accepted ideas respecting the causes which give rise to spotted typhus is inadmissible by the light of observation. As observation shows that the "*fons et origo mali*" does not lie in the vitiation caused by gases arising from excrement, and also suggests the thought that the epidemics of disease which occur from time to time, and, at the same time, not only in different points of America, but also in some parts of Europe, are due to a cause of general action, and not to local infractions of hygienic principles, it is evident that, instead of being confirmed in our old opinions, we come to entertain doubts, fears and questionings as to the prevention of the disease founded on circumstances which have been disproved by facts. It is not my intention to substitute the doc-

trine referred to by some other more or less ingenious, nor to decide if, in default of such new doctrine, we must go back again to the obscure theories of miasmatic effluvia or geographical perturbations in order to explain the phenomena in question. Up to the present time all bacteriological explorations have failed to lead to the discovery of any micro-organism in the secretions, the presence of which could account for the infection, and the requirements of modern observation cannot be satisfied with literal transcriptions which have been constantly repeated in books for many years past regarding the etiological influence of bad ventilation, privations, agglomeration of people and other circumstances inherent in poverty. Besides, these assertions have repeatedly been refuted, seeing that all the years in which there are dearness and scarcity of the most common articles of food are not years of epidemics of typhus, nor is this disease the one most liable to be caused by insufficient food nor by the moral depression occasioned by certain psychical impressions, and in fact the lower classes are not those which least resist the infection, but the higher classes, where the greatest mortality is to be found.

If the favorable conditions mentioned above call the attention of hygienists now as formerly, it is not because we detect in them the cradle, or, let us say the genesis of typhus, but simply because it is now clearly proved that the conditions facilitate the spread of the contagion.

So far as our present knowledge goes, as regards the prevention and rules necessary for the stamping out of petechial fever, we can only arrive at the following conclusions:

The generative cause of typhus is, so far, quite unknown to us, and the probability is that it may be due to influences of general, or, at least, very extensive action. When once an epidemic has broken out, there is no resource for stopping it or curtailing its duration better than the segregation of the patients, with the absolute suspension of all intercourse between them and those who have not been attacked and who have not already had the complaint.

I am well aware that before now and in different languages there has been pointed out the danger that consists in the community of habitation or other kind of communication between persons in health and those attacked by the fever. In spite of this fact, we must not consider it a loss of time to renew the foregoing recommendation, which is far from being a new one.

Unfortunately, we have still to lament occasions when a precaution, the benefits of which are traditional, is omitted out of considerations of very little moment, and misfortunes are caused that cannot be repaired

in families who are left without any adequate defense against the transmissibility of the virus.

When the public or the physicians have been convinced that a defective drain is sufficient to cause an outbreak of typhus, it has also been confessed that the best means of avoiding the infection, as also of stamping out the disease, when once it has appeared, would be the avoidance of the accumulation of excrement and the admixture of that of the patients with substances, the chemical action of which should destroy the virulence of the gases, prevent or modify the fermentation and the stench, and, in a word, should change the composition of the disease-bearing substance into that of a harmless one. Though experience has shown that the cause of the fever must not be sought in the aforesaid conditions, we certainly cannot assert that the filthiness and stench of the privies are in accordance with hygienic rules; the privies ought always to be kept clean, well supplied with water and situated at a suitable distance from sleeping rooms and kept freely ventilated, etc., and as regards the excrement of the patients, it is always well that they should be immediately removed from the bed-room and that all the clothing should be washed with the antiseptic *par excellence*, viz., boiling water. The only thing I wish to point out is that all these precautions of a hygienic nature, which consist in everything that tends to cleanliness, perfect and absolute cleanliness, are not sufficient by themselves to inspire confidence against the outbreak of the disease, and for the same reason cannot form the basis of legal steps taken with a view towards the protection of communities, nor once an outbreak has occurred, should they occupy the foremost place in the attention of the authorities, as regards the restitution of the public health to its normal condition.

New, patient and arduous studies must be undertaken to attain perfection, and, so long as we be unable to ascertain the unknown element of the case, there is no resource so rational and so imperative as the separation of the patients from those who have not yet been seized with the disease.

"I hold it to be," says W. Murray, "the duty of every practitioner who has time and opportunity to publish the results of his work. In doing this he lays himself open to the criticism that all this or something very like has been said before, but this does not destroy the value of his efforts, as he is at any rate confirming the work of others, and, generally speaking, the presentation of his facts will possess some features peculiar to the mind of the observer."

The illustrious Bennett (of Edinburgh) has sustained, many years ago, that "it is better to disperse the elements of contagion as much

as possible than to concentrate them by collecting the fever patients in special wards." If care be taken to lay out in a suitable manner the building destined to be a lazaretto, and it be situated at some distance from any town, we shall be able to unite the precept of isolation and the wise one of Dr. Bennett.

The idea of isolating the patients may be said to be purely empirical and contains a proof of our state of ignorance rather than of our advancement.

It seems useless to add that the success of isolation will be more certain and quicker the more the community afflicted with the complaint be in possession of the inestimable benefits which contemporary science has granted us regarding health and the preservation of the human species. In the same way as the individual who possesses the physical condition obtained by moderate habits, cleanliness in person and dress, tranquillity of mind and, in a word, devotion to the goddess Hygeia, bears within himself a shield which protects him, to a certain extent, from infection, so, also, do collective bodies who enjoy air, light, abundance of water, a fair amount of sunshine, good drainage, etc., represent ground but little fertile for the development and extreme virulence of seeds of typhus, or any other of the contagious diseases. It would be well if we could accept the theory which attributes the generation of that fever which, from time to time, plunges us into mourning, carrying off the most precious lives, to the stagnation of organic matter in a state of putrefaction, or to that train of misfortunes following on poverty; these factors, in place of an agent up to now mysterious and possessing an influence which extends over all the known world, would be accessible to the resources granted us by science against that kind.

It is a sad but necessary homage to truth to say that the illusion entertained, even to-day, by some physicians, cannot withstand the proof of experience, and that, in fine, this most interesting point of study obliges us to confess the necessity of new labors, repeating the notable words of the Marquis of Salisbury: "We live in a small oasis of knowledge, surrounded on all sides by a vast unexplored region of impenetrable mystery. From age to age strenuous labor of successive generations wins a small strip from the desert and pushes forward the boundary of knowledge. Of such triumphs we are justly proud. It is a less attractive task, but yet it has its fascination as well as its uses, to turn our eyes to the undiscovered country which still remains to be won, to some of the stupendous problems of natural study which still defy our investigation."

REPORT OF THE COMMITTEE ON CAR SANITATION.

By Prof. S. H. WOODBRIDGE, Chairman, Boston, Mass.

THE VENTILATION OF RAILWAY COACHES.

In the closing paragraph of an address by Dr. Charles B. Dudley, chemist to the Pennsylvania Railroad Company, on "The Ventilation of Passenger Cars on Railroads," given before the Franklin Institute in the early summer, and also in a statement yet more recently made to the writer by Mr. Theodore N. Ely, chief of motive power of the same company, are to be found the year's most encouraging signs of promise in this department of public hygiene.

Dr. Dudley said:

"I am sure I am speaking the truth when I say that railroad officers" (perhaps he should have said some railroad officers) "appreciate the hardship of having to sit a number of hours in a badly ventilated coach as much as the public do. I can state from my own knowledge that they are thoroughly interested in this subject, and I am safe in saying that the intention is to prosecute it to a successful conclusion as soon as possible."

Mr. Ely declared his regretful conviction as to the present wholly inadequate provision for ventilation in railway service, and recognized the justice of the Association's and the public demand for improvement. He characterized indifference regarding this matter by railroad managers and the apathy which prevents persistent effort toward bettering the sanitary condition of railway coaches as shameful.

In a brief paper sent to the Association last year, the belief was expressed that the surest method open to the Association for advancing the movement which it has for some years been agitating by discussion, must be through some financially strong and liberal-minded railroad company, whose affairs are managed with at least as much reference to the needs and comfort of their patrons as to the pockets of their stockholders. It is interesting to note that the railroad company then mentioned as the one most likely to respond to and second efforts made by this Association, is the one which to-day holds out the encouragement now brought to your notice.

The attitude of the Pennsylvania Railroad Company toward this question is the more important because of the probability that the lead of a strong road will be quickly and generally followed when-

ever a satisfactory solution of the method of accomplishing ventilation is reached, and when the public demand is thereby stimulated for those improved conditions which shall have been demonstrated as attainable and practicable.

As a result of several years of experimenting with different methods of car ventilation, the Pennsylvania Railroad Company has developed out of the old Spear system of stove heating and ventilation, a method which it considers superior to any device thus far tried.

The stove system (see Plate I) consists essentially of a jacketed stove, *d*, located at one end of the car. The chamber, *cc*, between the stove and the jacket, is connected at its bottom and on that side of the stove next the end of the car with the outside air by means of a pipe, *b*. This pipe is surmounted by a hood, *a*, open at both ends and fixed in position with its funnel-shaped ends open towards the ends of the car. The chamber, *cc*, is divided into two parts by septums, *ef*, the septums starting at the bottom of the jacket and completely separating the lower part of the chamber, and terminating at their upper ends at a point below the top of the jacket, so connecting the two parts of the chamber near the top of the stove. The chamber is connected at the bottom with a duct, *g*, carried on the outside wall of the car below the seats. On the inner side of this duct, openings, *hh*, are made into the car.

Air pressure at *a*, due either to wind or car travel, forces air down the pipe into the nearer side of the chamber, *cc*, up over one side of the stove and down over the other, and then into the distributing duct, *g*, and out through the apertures, *hh*. Dr. Dudley points out two objections to this method of car heating and ventilation; first, the use of a stove; second, the dependence of the system for action on either the travel of the car through still or favorably moving air, or else on the force and direction of the wind. When the car stands still, or when the wind and train travel in the same direction with equal speeds, the air movement through the pipe and distributing conduit is reversed. Such results must obviously take place as a necessary consequence of the construction—the pipe, *b*, entering the chamber, *cc*, at a higher level than the hot-air duct, *g;* and the pipe, *d*, having a considerable vertical run, becomes a chimney with strength enough to make the system's action one of discharge rather than of supply.

To obviate these objections, the steam method for car heating (see Plate II) has been utilized, the heating surface being massed along the side of the car, rather than being carried, as in some systems, in loops or runouts beneath the seats. The surface is what is known as "extended" form, and consists of cast-iron tubing of large size, having

disks or flanges cast in position at close intervals, a method of getting a large surface into compact space.

The air is brought into the car by the same means as heretofore described, being taken from above the car deck and at both ends, and, in the last experiments, by two intakes at each end. The air passes down into the space, *c*, below the floor of the car.

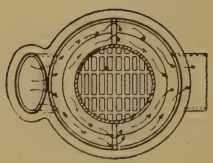
The car platform is made up essentially of heavy timbers running the length of the car. The space between these timbers is about fourteen inches clear, and the timbers are about eight inches deep. The floor of the car closes the upper part of the space between these timbers or sills, and the placing of an under or false floor below the sills converts that space into channel-ways, *cc*. Into the channels formed by the outside sills and those next to them, the air is entered.

Openings, *ee*, are made through the car floor into these channels. The heating surface, *dd*, is boxed in, and openings, *ff*, are made through the boxing into the car. The heater is now in a position above the cold air supply, and the openings for the out-flow of heated air are higher still above that air. The easy reversal of currents which, even in still air, has proved troublesome in the Spear system, ceases to be a disturbing factor.

Dr. Dudley states that when tests of this system were first made, the apertures admitting cold air into the heater from the inter-floor ducts were four inches long and three-fourths inches wide, the number of apertures corresponding to the number of seats.

The discharge ventilation was through six deck ventilators. The experimental car was loaded with men from the shops, for the reason that "a foreman could control the men in a way to secure the conditions sought," and for the further reason that existing conditions could be always known. A run of thirty-five miles was made, and air samples secured for analyses. The car was then kept in a stationary position for an hour, windows and doors being kept closed, and samples were again taken. The return run was then made and other samples obtained at the end of the trip. The air supply, as determined by these analyses, made it appear that when the car was in motion the air supply was five hundred cubic feet per hour to each occupant, and when at rest, three hundred and forty cubic feet.

As a result of this and subsequent tests, modifications were made in sizes of the apertures between the inter-floor ducts and the heaters; they were enlarged and their number was increased until at length they were made four inches by one and one-half inches, and were placed eight inches apart between centers on both sides of the car. The main intakes were increased from eight inches by eight inches to fourteen inches by fourteen inches, one being placed at each of the



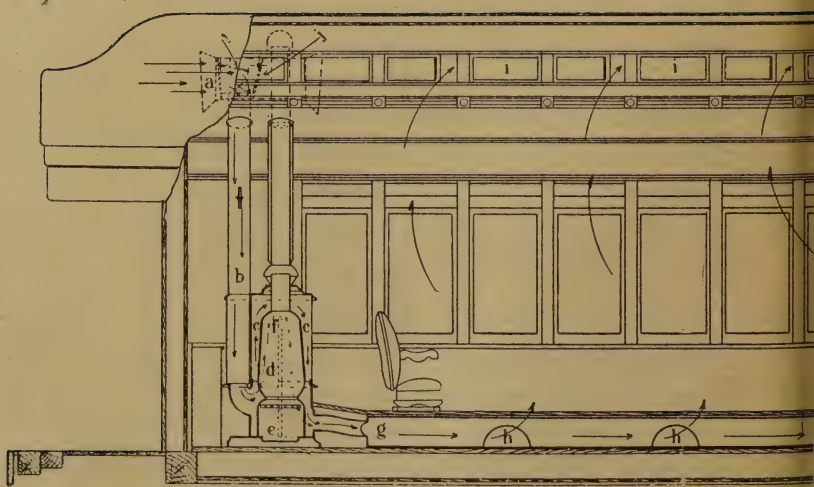
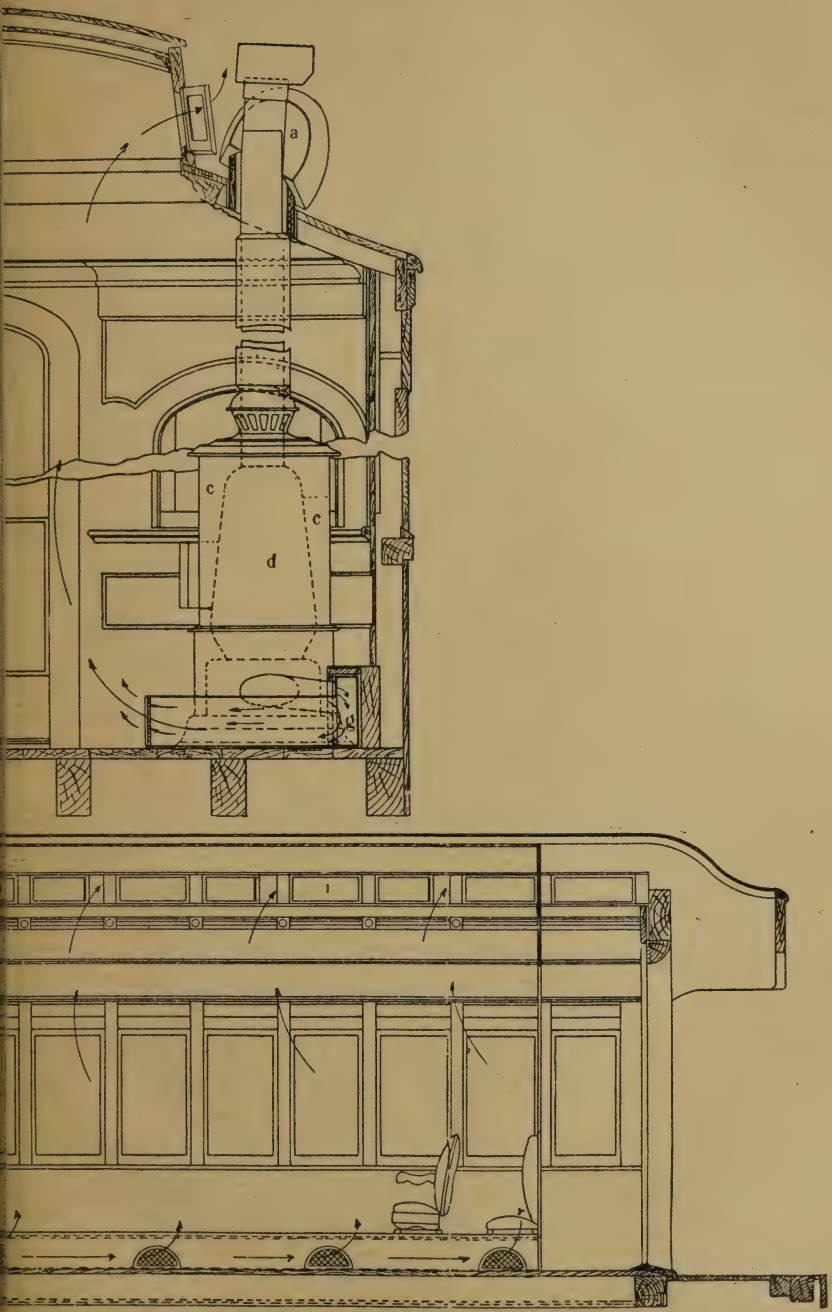


PLATE I.—SHOWING SPEAR STOVE SYSTEM OF HEATING AND VE



ATING PASSENGER CARS, NOW IN USE ON PENNSYLVANIA RAILROAD.

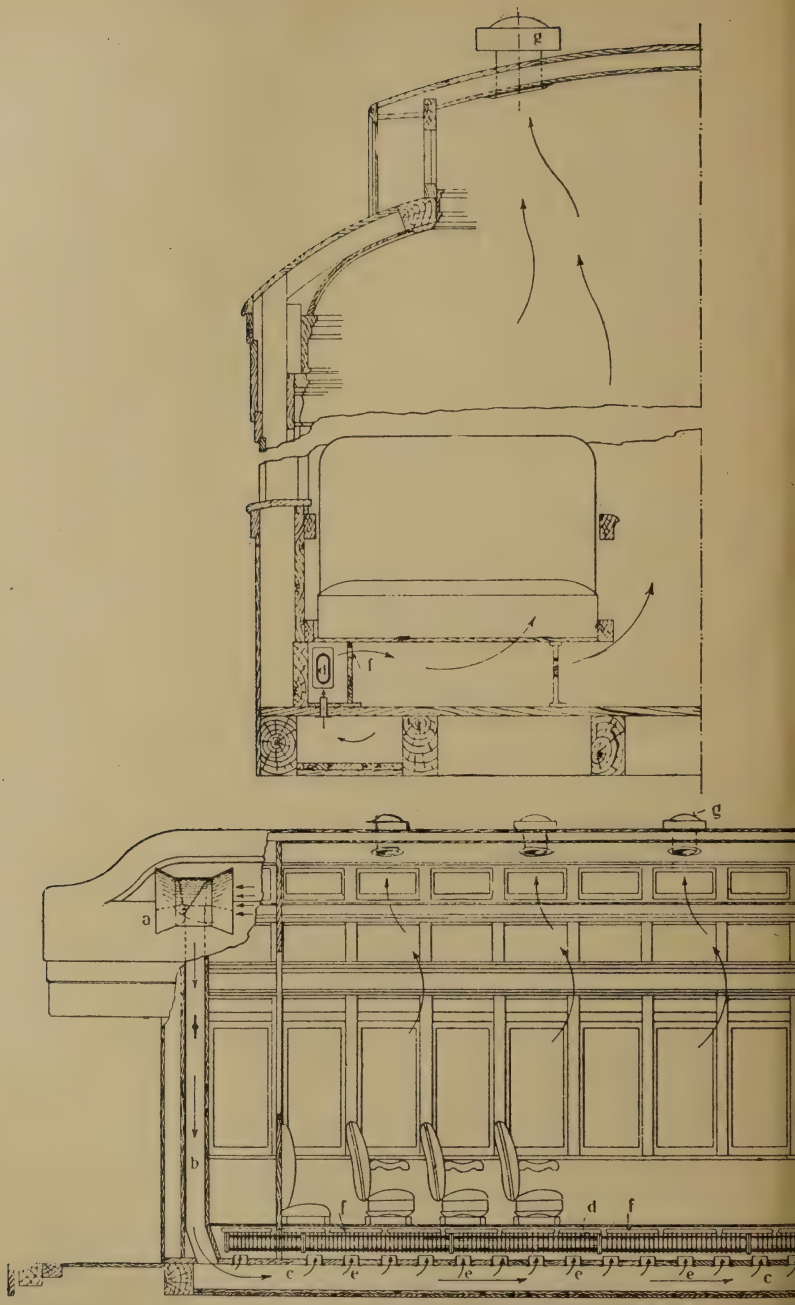
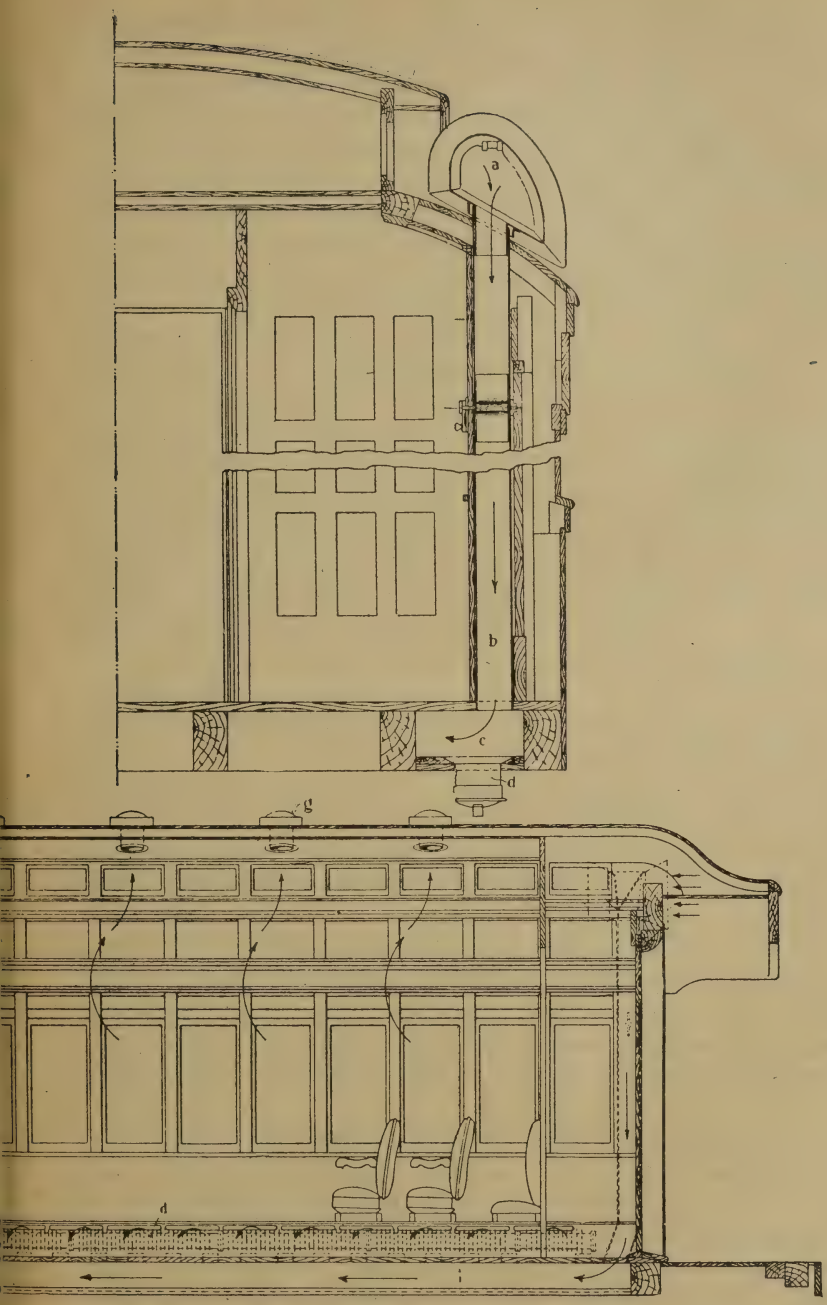


PLATE II.—SHOWING SECTIONS OF STEAM HEATED PASSENGER COACH ON



ISYLVANIA RAILROAD, AS MODIFIED FOR EXPERIMENTS ON CAR VENTILATOR

four corners of the car. Twenty discharge ventilators were placed on the top of the car. With these and other modifications, it was, after several attempts, found possible to obtain ninety thousand cubic feet of air supply for the car, presumably when in motion.

So far as ventilation alone is concerned, these experiments proved encouraging and on the whole, satisfactory. Air filtration was not attempted, and its use would doubtless seriously embarrass the performance of the system if thorough cleansing of the air were effected. The fresh air is admitted at the floor in the location of the largest dust deposit, and in a manner not ideally the best because of the tendency of the air currents to disturb and float the microbic dust, whose quiescence is, on hygienic grounds, greatly to be desired.

The chief difficulty, however, which the experimenters abruptly found themselves face to face with was that of warming the air used for ventilation, a matter they found beset with many difficulties and one which presumptuous novices in car ventilation should be made to ponder before being allowed to press the claims of their inventions on railway managers to the waste of funds and to the retarding, through disheartenment, of a normal and scientific development of the problem because of the discouraging outcome.

In speaking for the Pennsylvania Railroad management, Dr. Dudley says:

"To our minds the problem of car ventilation stands now something like this: It is possible to get much more air into a car than any system now in use takes in. It is possible, if we could content ourselves with twenty thousand to thirty thousand or forty thousand cubic feet of air (per car and per hour) in severe weather, to have such a ventilation put on the cars to-day. Then in milder weather we could increase it to the full capacity of the system. That phase of the question is being studied already quite earnestly. On the other hand, as every one knows who knows anything about railroad matters, where there are twenty-five hundred passenger cars requiring to be changed it is simply ordinary business prudence to exhaust a subject pretty thoroughly and be sure of the ground before going ahead."

It would seem, therefore, that in the line of experimentation followed by the Pennsylvania Railroad Company, the solution of the problem of car ventilation has not been carried up to the point of warming the car in sharply cold weather without diminishing the air supply at such times. By freely venting at the top and by admitting fresh air at the bottom through ducts aggregating something over five square feet, ninety thousand cubic feet of air per hour may be passed into the car when the car is in motion or wind action is favora-

ble, and it seems probable that a very fair ventilation may also be obtained by these means when the car is at rest and the inside and outside temperature difference is sufficient to produce a continuous flow of air through the system.

In a recent letter received from Dr. Dudley, he writes that "since the Franklin Institute paper was prepared, we have made a number of experiments which indicate that while our present heating system will not warm ninety thousand cubic feet of air per hour, it will warm sixty thousand cubic feet, and we are having a few cars fitted up now on the plan outlined in that paper, but it is too soon yet to give any positive results of how the scheme is going to work * * * We have moderately strong faith that, while we do not accomplish all we set out to accomplish, we will get a very great relief from the present condition of affairs in regard to the ventilation of passenger cars."

That for which the Pennsylvania Railroad management "set out" was theoretically ideal ventilation as based on the deductions by Parkes from tests made to determine the per capita quantity of air required to maintain such purity of enclosed air that no odor should be detected in it by one having normal olfactory sensitiveness and suddenly coming into it from the outside air.

Such a standard is not applicable to, because such ventilation is not required for, railway cars. In the first place, there are some things worse, because more dangerous, than slightly or even moderately tainted air. Draughts are more quick and deadly in their effects than scarcely or easily detectable odors in air. Parkes' standard for perfect ventilation is three thousand cubic feet per capita per hour. A day coach seats sixty, and that standard would require one hundred and eighty thousand cubic feet to each car per hour. Such quantities of air can be safely supplied only when the per capita space is large, the air movement due to ventilating currents correspondingly slow, or when the means for diffusing its movement and breaking the draught effects are exceptionally effective. The per capita space in a full day coach is something like sixty-five cubic feet. A change of air once each five minutes would furnish each breather of a full car with but seven hundred and eighty cubic feet of air per hour. A change each two minutes would furnish a little under two thousand cubic feet to each seat per hour. The advisability of attempting to reach that limit and maintain that degree of ventilation is perhaps questionable, both because of draught liability and for other reasons of equal weight.

In the first place, the personal or effluvia odor in air depends quite as much on the quality as on the quantity of the organic matter in suspension. The quality of that matter depends, to a considerable

extent, on the thermal and humidity conditions of the air itself. The odor and doubtless the harmful quality of effluvia are intensified by changes incident to its exposure in air. In a fermented or putrid state, normal effluvia is far more offensive and morbific than when first transpired. Moisture and heat accelerate the process of decomposition and putrefaction. Had Dr. Parkes' tests been made in the dry air of Colorado or Arizona, rather than in the moist air of England, his standard as to the quantity of air required for ventilation would probably have been materially lowered.

It is a well recognized but not generally understood fact that a per capita quantity of air which is sufficient for good ventilation in small per capita enclosures is inadequate in large per capita enclosures. The organic matter given to the air is no greater in large than in small enclosures, but the time of its retention is longer, and its organic change in the direction of decomposition and putrefaction is proportionately advanced. With a rate of per capita air "change" reduced from once in twenty to once in two minutes, the air supply for equally good ventilation in the smaller space could safely be reduced to one-half that needed for the larger space. In ordinary modern school rooms, the air, if changed once in six minutes, would give an hourly per capita supply of nearly two thousand cubic feet, a quantity deemed sufficient for fair ventilation. Probably a per capita supply of one thousand two hundred cubic feet per hour, when the rate of change is once in two minutes, would furnish equally good ventilation results with the two thousand in the school room.

Furthermore, passengers are exposed to the air of railway cars but a small fraction of the time that scholars are exposed to the atmospheric condition of school rooms, and in general the danger increases with the time of exposure to it.

Lastly, if a moderate per capita supply of air is furnished for a *full* car, the average actual supply per passenger will be in large excess of that quantity, for the reason that cars in long-distance trains are seldom full for more than a part of the trip.

For these several reasons, therefore, namely, the unnecessarily high standard of Parkes for average America winter conditions; the effect of small per capita space in reducing the air quantities needed for ventilation; the small time of the exposure of travelers to atmospheric conditions within cars; the vacancy of many of the seats during long runs; the maximum figures, temporarily, at least, adopted by the Pennsylvania Railroad management, may be considered as in the line of advancement certainly—a long and satisfactory step, and one on which the Association, the public and the company are to be congratulated.

The cost and difficulty of heating railway cars, and of warming generous quantities of air for ventilation also, are put forward as an almost insurmountable obstacle to the attainment of the ideal conditions this Association doubtless desires to urge and to see realized. The proper warming alone of a modern railway passenger car in severe weather, and when the car is in rapid motion, requires nearly sixty pounds of steam per hour. To warm from zero to seventy degrees an air supply of one thousand cubic feet per hour for each of sixty passengers requires, approximately, eighty-three pounds of steam per hour.

In the case of a train made up of eight cars and with ventilation provided on the basis of two thousand cubic feet of air per hour for each seat, the total steam used in heating and ventilating work would be, for heating four hundred and eighty, and for ventilating two thousand six hundred and fifty-six pounds per hour, or nearly twenty per cent. of the steam-making capacity of our larger locomotives.

Locomotives are made with chief reference to the maximum traction duty to be required of them, and with no reference to furnishing steam for any other purpose than drawing trains, working pumps, and sometimes for furnishing electric lighting for the train. Their working varies greatly with grades, long and sharp gradients sometimes requiring all the steam the engine can be made to produce. At other times there is surplus of steam, as on level runs, down-grades and on moderate up-grades. A ventilating system must be adapted to the available steam supply, as affected by the weights of the train and the grades of the road. Both of these factors are variable quantities, the weights of trains varying with each train made up and with its full or empty seats. So, also, the grade for every train varies from mile to mile. A ventilating system should, therefore, be under the control of the engineer. When every pound of steam his fire can make is needed to draw the train, he should have ready means for reducing or even suspending ventilation, and of starting or increasing ventilation when his engine is relieved from traction work. Otherwise, with a constant flow of outside air into the car, that air will blow hot and cold, according to the steam the engineer can spare for warming air for the passengers' breathing.

The Pennsylvania Railroad at present warms its cars in part, and in mildly cold weather almost wholly by waste steam from the engine pumps and returns the condensation from the cars to the engine. When a further and a longer step is taken, and a small part of the exhaust steam from the driving cylinders can be diverted to the warming of air for ventilating work, an important gain will be made in the solution of this difficulty-beset problem. To utilize the enor-

mous waste in the exhaust steam from an engine is, in all economical and mechanical respects, more desirable than to build bigger engines and to provide the heavier rails and stronger bridges and other requirements which such a radical change would entail.

MECHANICAL VENTILATION OF RAILWAY COACHES.

Mechanical ventilation possesses some evident and important advantages over ventilation produced by any other means. It is dependent on a force controllable at will, and is, or may be, wholly independent of varying differences in the temperatures and weights between inside and outside air; of the direction and the force of winds; of the heights of flues, and, to some extent also, of the size of flues. In application to buildings, its superiority *per se* to gravity ventilation is not to be questioned. Is it equally applicable to car ventilation?

Ideal ventilation seems to require its use in passenger cars quite as much as in buildings. Are the gains to be made by its use of sufficient hygienic value to compensate for the costs attending its installation and use?

The problem is one involving important and complex questions, both upon the side of practicability from a mechanical and economical standpoint, and also upon the side of hygienic gain to be realized. It is not to be reasonably condemned and put aside as impracticable by railroad managements because of off-hand judgments regarding its cost, its cumbersomeness, its complication. Neither can its use be any more insisted on by health boards or by the public because of an unreasonable insistence on reaching and holding to certain and adopted standards of railway hygiene, the vital importance of which has yet to be demonstrated. The question is to be eventually determined on its merits, and not by apathetic conservatism on the one hand or unreasonable radicalism on the other.

The sentiment of railroad management is undoubtedly opposed to the employment of mechanical ventilation, or, as one official has recently and tersely put it, "to turning passenger trains into machine shops."

It is the purpose of this paper to bring forward, in more complete description than has been heretofore given, a plan for mechanical ventilation which was prepared and partially presented to the Association two years ago, and to show in more detail its adaptation for meeting some of the important requirements of a system for car ventilation. The plan is offered not as a perfect method, nor perhaps the best the originator could, on further study, devise; but as an initiatory movement in the direction of mechanical ventilation, made

for the purpose of eliciting intelligent criticism which shall show its use to be either unnecessary or impracticable, or else to demonstrate its worth and practicability, and, best of all, to produce something better.

That a well known car builder, a master mechanic, and a chief of motive power of a railroad widely known for the scientific, practical and profitable methods of its operation have pronounced the system capable of, and well fitted for doing its intended work, is not to be regarded as an endorsement of it further than was given in the statement by the last-named gentleman that "if we cannot get what is wanted in any simpler way, we surely can get it by such means as are shown in this plan."

The aim sought in the planning of the system now offered as a "starter" is, first, a supply of air as little as possible dependent on conditions external to the car, and controllable by the engineer according to the steam supply available for warming air, or to other circumstances affecting the required or usable quantity of air.

Second, means for filtering the air and for warming it to the required degree, whatever the quantity of air used within the range of the system's capacity may be.

Third, the entering of the air at a part of the car where entering currents will result least harmfully in draught, and also in such locality and manner as to least agitate and to float the microbic and other dust, which is thickest at the floor, and to which place it should be precipitated as rapidly, and from which it should be removed as effectively, as possible.

Fourth, the removal of air from the floor level where dust is most dense, and where the more impure air, under the proposed location of supply and discharge apertures, would be found.

Fifth, the warming of the car by heat distributed along the outer walls at or near the floor, where heat for neutralizing the effect of a cold floor is needed, as also for foot warming and clothes drying.

Sixth, the control of car temperature by thermostatic means designed with reference to its actuation by the average temperature within the car, rather than by its temperature at any fixed locality.

Plate III shows the principal parts of the apparatus compacted in one corner of a car, occupying a floor space some fifty per cent. larger than that given to the old-fashioned stove heater and coal box. At *I* is located the air inlet, 6 inches wide by 24 inches high, shown as placed in the side of the car. This aperture is covered with a *V*-shaped screen of stout wire netting, within which is a light and easily swinging deflecting leaf or plate which readily responds to wind action.

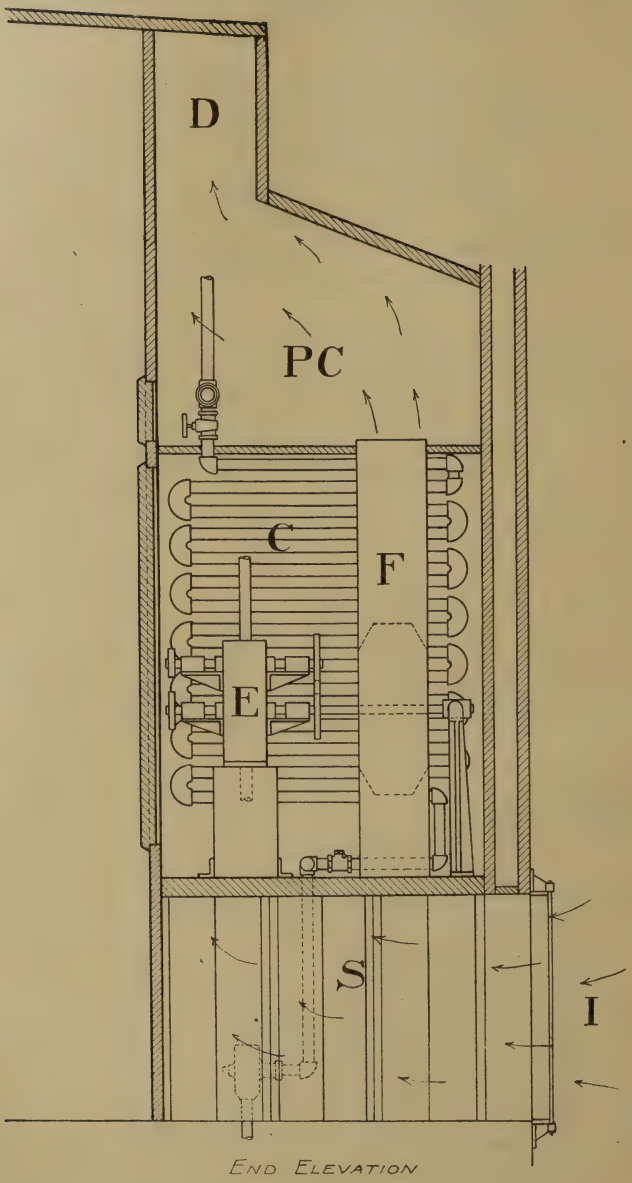
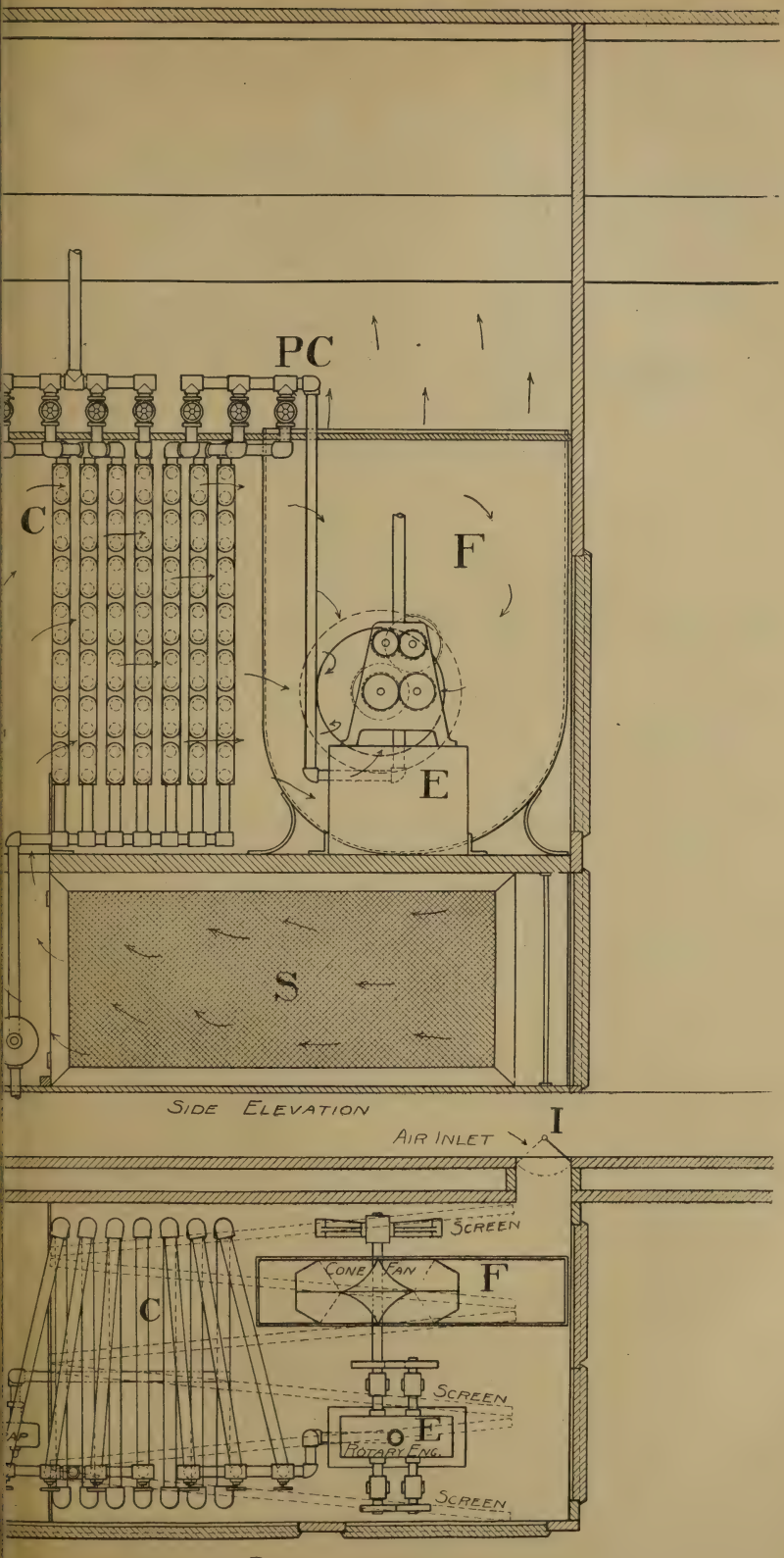


PLATE III.—Arrangement for heating and ventilating Passenger Cars by S. H. Woodbridge, Boston, Mass.


PC
C
F
E
S
SIDE ELEVATION
AIR INLET
I
SCREEN
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F
C
SCREEN
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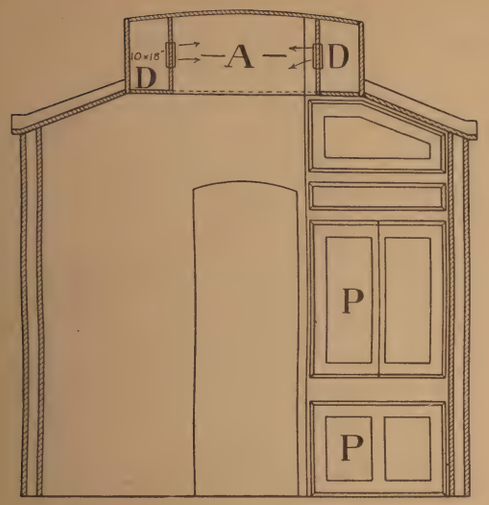
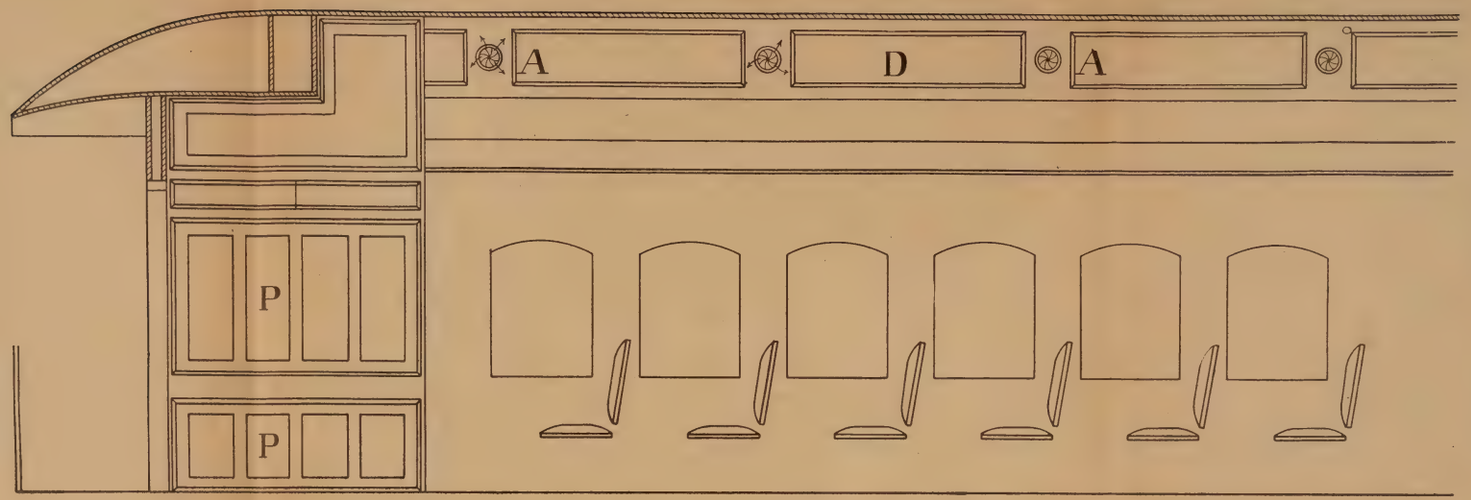
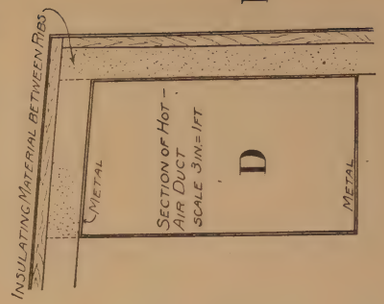
ROTARY ENG.
SCREEN
PLAN

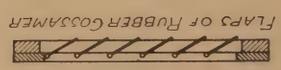


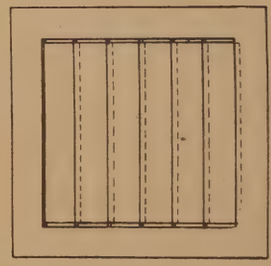
END ELEVATION SHOWING FAN APPARTMENT



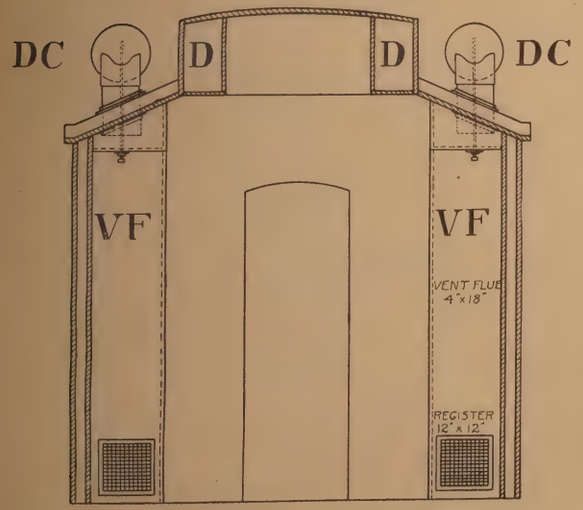
LONGITUDINAL SECTION



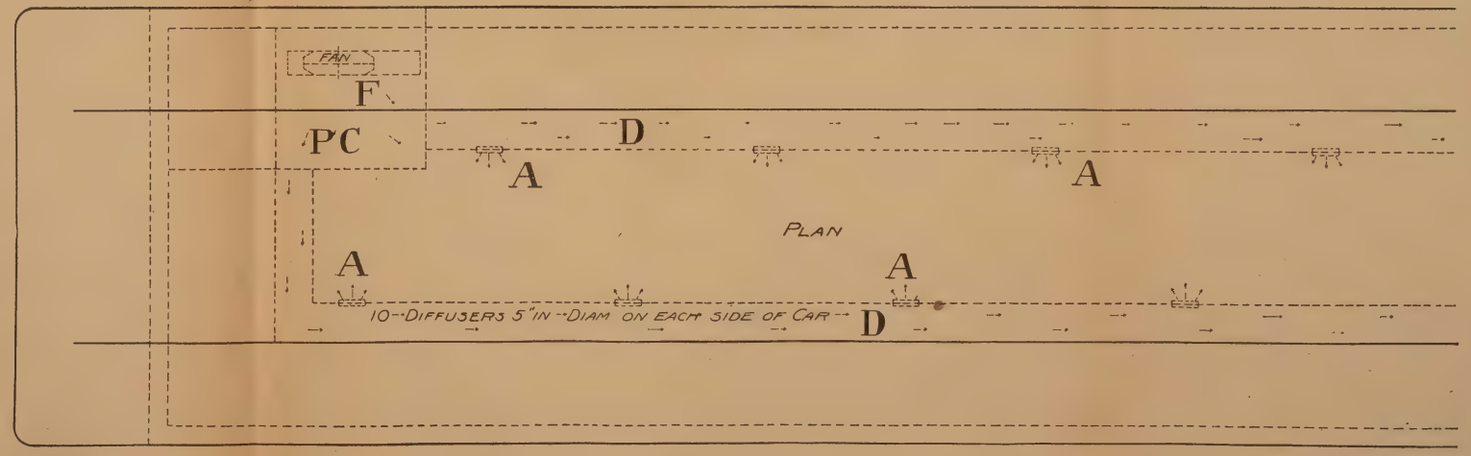




DETAIL OF VENT REGISTER SHOWING CHECKS SCALE 3"=1'



END ELEVATION SHOWING VENT FLUES



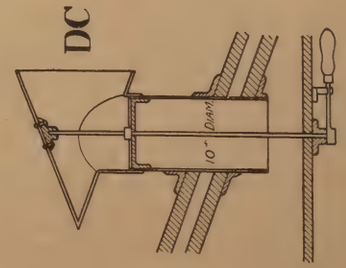


PLATE IV.—Showing sections and details of appliances for car ventilation.—Woodbridge.

This inlet is shown on the plans, and the deflecting plate on the lower right-hand figure.

Neither this position nor type of inlet is essential to the operation of the apparatus. It is chosen for illustration because of the convenience of location, and for the reason that its position is as favorable as any for freedom from both smoke and dust. Such mechanical advantage as is to be gained by wind action is secured by the swinging deflecting plate mentioned.

Entering *I*, the air encounters the filtering screen *S* spread on hinged frames for closing and removal when cleaning or renewal is required. The screen is made of a fire guard, or spark-arrester, of fine wire netting backed by several layers of loose-woven woolen cloth, or a thin layer of fluffy wool properly secured in place. The vertical position of the filter, as well as the jarring to which it is continuously subjected, tends to keep it clean and to deposit arrested dust on the floor of the cleansing chamber.

This filter has an area of nearly 40 square feet in the six folds shown in the plate, right-hand lower figure. The texture must be so open that an air flow of 6 inches per second linear movement through it must be possible under the small air pressure available for drawing it through such resistance.

Passing the filter, the air moves upward and traverses the steam heater or coil *C*. This coil is made up of 1½ inch wrought-iron piping and contains about 60 square feet of heating surface, sufficient to warm 1500 cubic feet of air per minute from zero to seventy. This heater is divided into main sections, one consisting of four and the other of three sub-sections; each sub-section is controlled by an independent valve, making it possible to use any number of sections called for by the weather conditions. One of these sections takes steam from the main, direct from the engine; and the other is arranged for taking the exhaust steam from the rotary engine *E*, which drives the fan *F*.

The engine is of the rotary type recently developed by the Westinghouse Company, and is specially well adapted to this work. It is mounted with special reference to quiet running, being, with the fan, supported on a strongly-made platform.

The fan *F* is of the blower type, having a double inlet, and being carefully balanced for noiseless running. It is mounted in a stout steel casing specially designed for ensuring quietness of action and freedom of air flow. At a speed of 800 revolutions per minute it delivers into the plenum chamber, *PC*, 1500 feet of air at an expenditure of less than two-thirds horse power, and about 45 pounds of steam an hour.

The engine is run by low pressure steam carried by a special pipe beneath the car for the purpose. The speed of the fan varies with the steam pressure in this main, and that pressure is under the control of the engineer. By varying that pressure he may therefore vary the fan speed and air flow at will from nothing to the normal or the forced capacity of the fan. The steam for the heater is supplied through the pipe which furnishes steam for the car heating, or, if desired, from the same pipe which supplies steam for driving the engine.

With the dropping, or the shutting off of steam, the air flow correspondingly drops or ceases, and an inflow of cold air does not result, as it would through any system in which air quantities entering the car were not made to bear a proper relation to the steam available and used for air heating.

Plate IV. The left-hand upper figure shows the casing at the end of the car which encloses the apparatus just described, and, together with the upper right-hand figure, shows the removable panels for access to the apparatus. All the panels about the engine, fan and in front of the filter are made removable.

Both the upper and lower figures on both sides show the air ducts *D* into which the air passes from the plenum chamber *PC*. The manner of its entrance into these ducts is shown in the lower right-hand figure where the fan *F* also appears, together with the plenum chamber *PC*. The ducts *DD* are built into the monitor construction, the exposed top and sides of which are protected by insulating covering. From these ducts the air escapes through ten 4-inch circular apertures on each side of the car, aggregating 240 square inches area. These openings are given either an alternating or opposite position according to the finish of the monitor construction. They are furnished with fixed diffusing caps of wind-mill pattern, the stationary blades of which give the air issuing through the apertures as widely varying directions as there are blades in the cap, so effectually breaking up the mass movement of the issuing air and dissipating draughts.

The removal of spent air may be effected by several means. The method offering the greatest advantages would be one which should withdraw the air through the floor, and at frequent intervals, from one end of the car to the other. Openings through the floor for this purpose could be placed beneath the seats at the end next the aisle, upon each side of the car, and made to open into a duct formed by adjacent floor sills and the upper and lower floors of the car, these ducts to have connection with outboard discharge shafts *VF* at two or three corners of the car. In the figure, these ducts are shown as taking air from the corners and at the floor, a method less well adapted to securing the best distribution of air throughout the car.

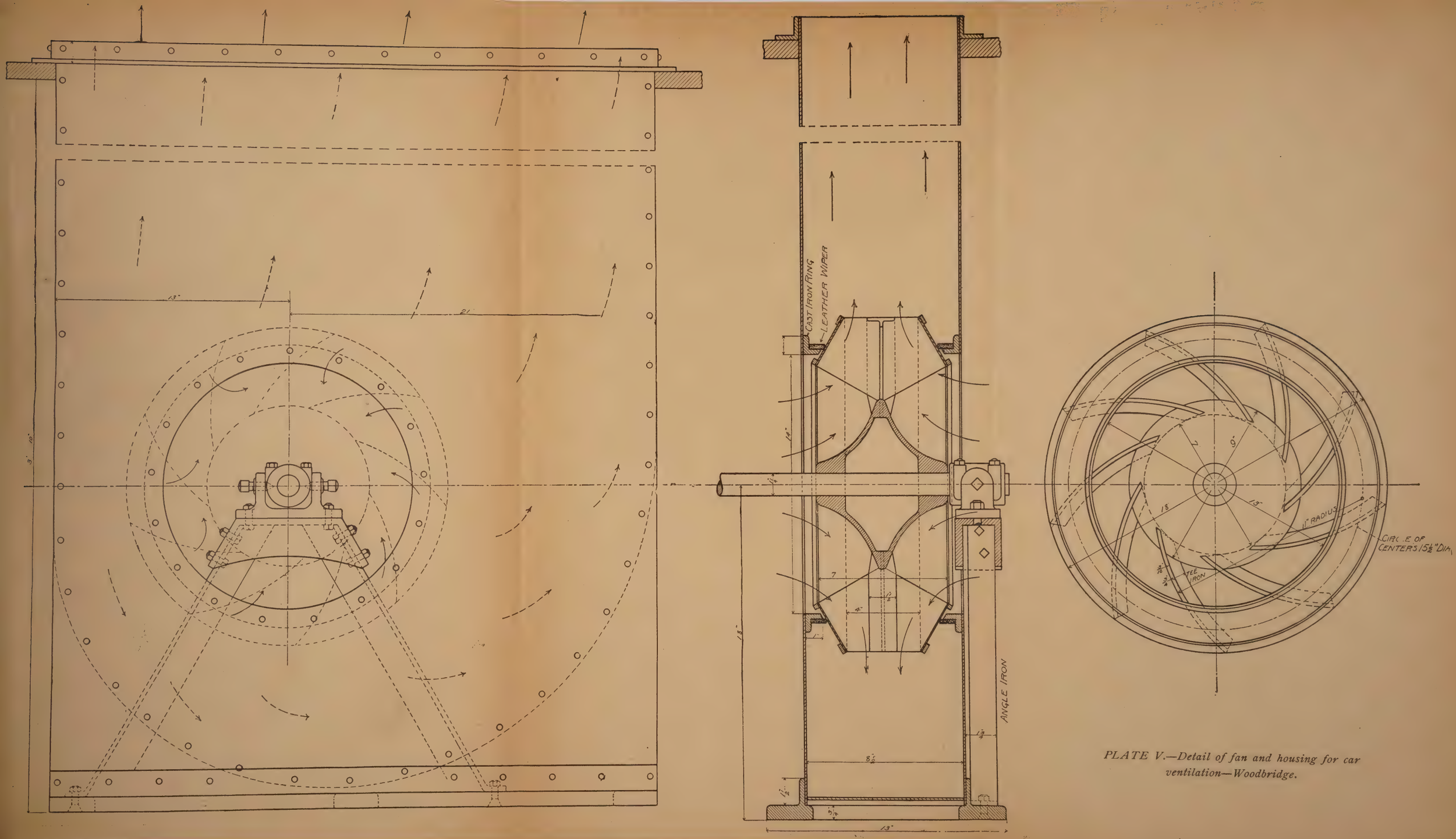


PLATE V.—Detail of fan and housing for car ventilation—Woodbridge.

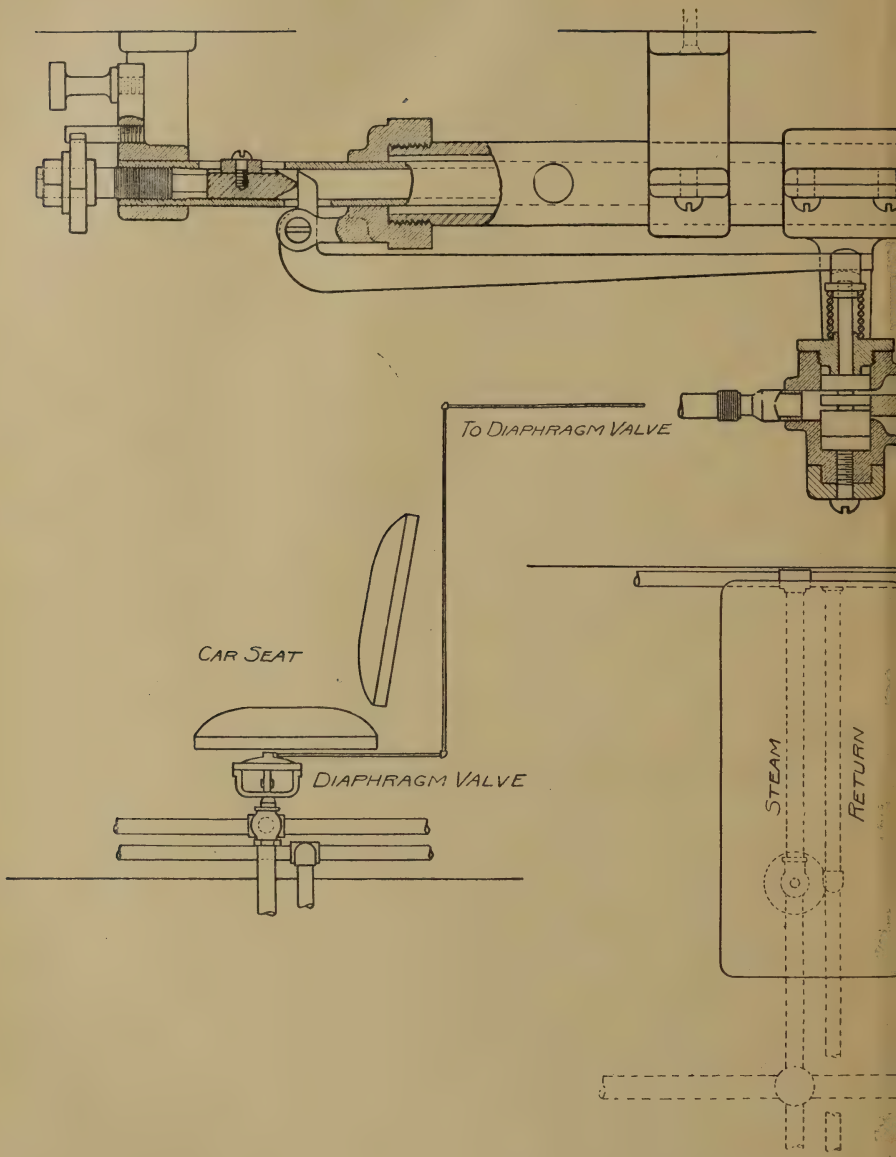
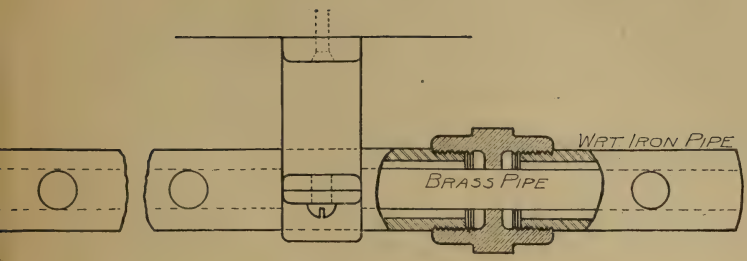
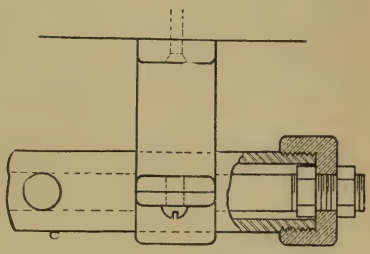
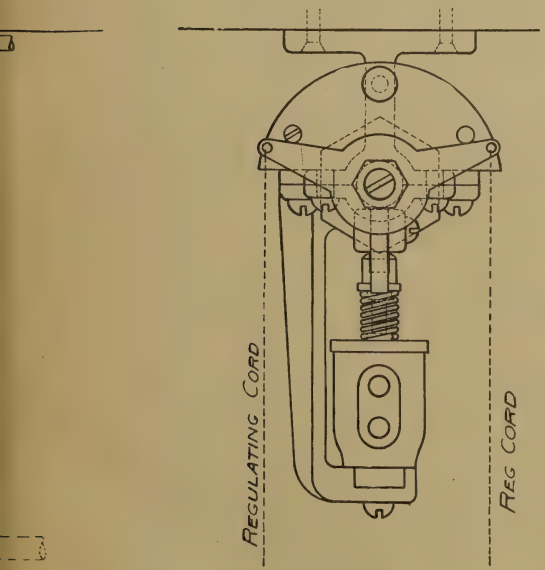


PLATE VI.—Theostat and valve con



R VENT





ons for passenger coaches—Woodbridge.

These discharge shafts are surmounted by hoods which may be of the fixed type, as the Globe or Star pattern; or they may be of the movable pattern shown. In the latter case they are to be swung into position and fixed in place by handle lever bars furnished with appliances for holding them in fixed position.

To prevent the reversal of air flow under fitful or sustained wind action, check valves may be placed in the vent registers in the manner indicated in the detail sketch. These checks allow free ingress of air to the flue, but prevent its egress through the register.

Deck vents may be provided for summer use in cars equipped in the manner now being described. In summer weather such escape of hot air from the ceiling is imperative. At such times any artificial ventilation is so inadequate as to be practically worthless, and recourse will be had to open windows and doors, or to any method inducing comfortableness.

Plate V. To this plate only passing notice will be called as it illustrates with some detail the make-up and mounting of the fan or blower and its housing.

Plate VI. These figures relate to the mechanism proposed for the automatic regulation of temperature within railway coaches. Such a coach is practically a long, narrow, low-studded room, and, as such, is liable to unequal temperatures in its different parts, due to the opening of doors, to the unequal leakage caused by the excess of outside air pressure on the forward end of the car, or to the unequal leakiness of windows, or the down-flow of air through deck ventilators when the supply though inlets is unequal to the demand of the vents.

A car thermostat should be affected, with reference to its actuation, by the mean temperature of an enclosure rather than by a local temperature.

The figure shows a long iron tube securely mounted in slide rests and running the entire length of the car. The tube is generously perforated to admit air to the inside. Within the tube is a brass rod firmly secured at one end and free to move at the other, this end of the rod extending beyond the tubing. The unequal expansion and contraction of the two metals is made, by a simple mechanism, to operate a slide valve which, in one position, admits air under pressure to a steam valve furnished with diaphragm for actuating the stem. When air is admitted above the diaphragm, the valve is closed, and steam is excluded from the coil or heater. On the other hand, when the air pressure is released, the steam valve is raised by an actuating spring which acts, in co-operation with the steam pressure beneath the valve, to lift it. A slight extension of the brass rod beyond the

iron tube can thus be with sureness made to shut off the steam supply from the heater, and the withdrawal of the brass rod into the iron tube by a very small amount, can similarly be made to admit steam into the heater. The air pressure for this purpose is available in that maintained for the operation of the brakes.

By means of a fine adjusting screw, the mean temperature at which the steam valve would be opened or closed is determined.

Only a general description of the principle and of the modus operandi of the apparatus is here attempted as sufficient for the purpose in hand, the entire aim of which is suggestive and tentative rather than demonstrative and assertive.

The practical utility of this paper is expected to be found in the productive discussion by practical railroad men which it may elicit, rather than in the intrinsic value of the plan proposed, and for this purpose it is offered.

RAILWAY HYGIENE AND THE INDIANA STATE BOARD OF HEALTH.

It is gratifying to be able to bring to the notice of the Association the wise and energetic way in which the State Board of Health of Indiana is urging hygienic methods and practices upon the railroad managements within their State. Such activity should become general with the boards of health throughout the States, and with their northern and southern neighbors. In co-operation with these boards, this international association of specialists should press upon the general railway service the just claims of the public to protection against the acknowledged and menacing dangers to health and life which are inevitably incident to the promiscuous herding of all sorts and conditions of humanity in enclosures, to the cleanliness and airing of which only slovenly attention is given and niggardly sums are appropriated; —then the day will be hastened when the majority of railroad managements will be found not standing in blind contempt to the common obligations of our human brotherhood, but in hearty co-operation with the humane efforts of this Association and other kindred bodies.

The success of all efforts to such an end will be furthered by an avoidance either of extreme demands, or of a putting forward of even approved methods with anything like an arbitrary or mandatory mien. In the persuasiveness of reasonableness must lie the strength and the hope of such an undertaking. The too common rashness attending ignorance of the real nature of a problem, and of the difficulties to be encountered and overcome in its solution, may easily result in discrediting its promoters and bringing their efforts into contempt.

The following letter from Dr. J. N. Hurty, Ph. D., Secretary of the Indiana State Board of Health, is of too great value and general interest to be in any way abbreviated:

Prof. S. H. Woodbridge, Boston, Mass.:

DEAR SIR:—Permit me to respectfully address you on car sanitation in Indiana, asking that you incorporate in your report to the American Public Health Association such matters here presented as may seem to you to be proper.

There are in Indiana 6,293 miles of railroad operated by seventy-three distinct companies. Over this mileage roll daily an average of three and one-half trains each way, making in all 44,050 miles of passenger travel, a distance equal to one and five-sixths times around the earth. There is an average of two and three-fourths passenger cars to each train, and 438 trains, making therefore in daily use, 1,204 cars. The passengers number not less than 20,000. These facts are certainly interesting and will serve to emphasize the already plain importance of car sanitation.

The Indiana State Board of Health has, during the past two years, made strong efforts to secure cleaner cars, to introduce disinfection and to induce better sanitary construction. The following suggestions for sanitary car construction and care have been offered to several railroad companies operating in Indiana, but only one, the Cincinnati, Cleveland, Chicago and St. Louis (Big 4), has officially promised to adopt all practicable suggestions as rapidly as circumstances will permit.

SUGGESTIONS BY THE INDIANA STATE BOARD OF HEALTH TO INDIANA RAILWAYS, CONCERNING THE SANITARY CONSTRUCTION AND SANITARY CARE OF PASSENGER COACHES.

Construction: The *interior* should meet the following requirements:

(*a*) Easily cleaned and kept clean.

(*b*) Equable warming, perfect ventilation with exclusion of smoke and dust.

NOTE. It is impossible to perfectly attain these conditions, but they should be approached as near as possible.

To secure (*a*): Material composing interior should be hard, susceptible of polish and unabsorbent. No channeled or bead work or carving below the windows; window ledges rounded; windows to have curtains of smooth unabsorbent, flexible material, inside slatted blinds not allowed as they have so many corners and cracks where dirt may accumulate and cannot be properly cleaned. *Seats* to be supported on the aisle by a plain round iron post, painted with enamel paint; arm rests to be round or oval, without upholstering; plush not to be used for upholstering if any other more generally suitable material can be had, which is doubtful; bottoms and backs removable, and the backs upholstered only in the center, the edges being hard varnished wood or, if completely upholstered, to be supplied with clean linen covers.

Closets to be floored with metalicized or filled wood, wainscoting the same, the latter being perfectly plain and smooth. Hopper should be a plain porcelain cone delivering all dejecta into a drawer containing dry absorbent earth and supplied with a mechanical device which would, by pulling a chain,

sprinkle dry absorbent earth upon discharges; the drawer being emptied at terminals, cleaned, and two inches of absorbent earth placed in same before restoring to its place in the car.

The heating pipes should be covered with an enameled metal shield to prevent expectoration and dirt from falling upon them. No carpets or matting should be permitted in the aisle, but a strip of plain rubber floor covering is allowable.

To secure (*b*): First, as to the principles of heating and ventilating: Heated air rises, and not until the upper part of an apartment is warm, is it possible to warm the lower part. Vitiated air accumulates mostly below the breathing line. By the present method of warming and ventilating, the warm air rises and is largely drawn out through the ventilators in the deck, thus wasting heat, and leaving the lower vitiated air in the car to be swept out by drafts from the open door, or by reversal currents (drafts) through the deck ventilators. The present way of ventilating cars may rightly be called "The Inefficient and Injurious Draft Method."

The problem of equable warming and of ventilation without drafts, dust and smoke may be at least partly accomplished as follows:

Between windows and between the walls of the car, place ducts leading from a register level with the floor out through the top of the car, providing movable hoods to the projecting ducts; or else lead the ducts into a pipe traversing the whole length of the car providing this pipe with valves at each end, the front valve to be always closed. Into these ventilating ducts lead a branch from the heating pipes. This will warm the air in the duct, causing it to rise and draw out the bad air from near the floor, and at the same time, draw down the warm air from the ceiling. As this method draws the bad air out, fresh air may be admitted through a few of the "ventilating ducts" which are not provided with hot pipes and which contain loose cotton, which will strain out dust completely and smoke partially. Double doors should be provided even in vestibuled cars. The second or innermost door to be supplied with closing spring hinges, to contain a glass panel, swing both ways and stop the narrow passage between the closets and wash rooms which are at both ends. If properly managed this arrangement will keep out drafts, dust and smoke when the outer vestibule door is opened at stations.

DRINKING WATER.

The drinking water should either be distilled or sterilized. Frequent analyses of the supply would be very well, but the only certain way of obtaining water above suspicion is to distil or sterilize it. Water tanks could be of metal and arranged as at present, but plain porcelain tanks in full view would be far better. The drinking glass should be smooth and round bottomed. For those who will not drink from a glass used by another without first washing the same, small paper cups might be furnished from a slot machine for a penny.

DINING CARS.

The principles (*a*) and (*b*) should be strictly followed in dining car construction, and in addition the kitchen interior, the dish lockers and food boxes should be constructed with especial effort to avoid cracks and corners. Refrigerators and food boxes should be lined with enamel, all wooden racks being carefully avoided.

CLEANING AND DISINFECTION.

Coaches should have a porter in attendance constantly cleaning and wiping en route. Upon arrival at terminals, seats and backs of seats should be removed and dusted by the air blast, floor should be scrubbed and all wood work below the top of the windows washed and wiped, seats and seat backs then replaced and the whole interior sprayed with a five per cent. solution of formaldehyd by means of a spraying apparatus carried on the back like a fire extinguisher. Car should then be closed and allowed to remain so for at least three hours and then rewiped with clean, sterile cloths.

In answer to the above circular, the Indiana railroad referred to above, replies as follows:

Indiana State Board of Health, Indianapolis, Ind.:

GENTLEMEN:—We acknowledge, with thanks, the receipt of your circular concerning car sanitation. Your suggestions as to car construction from the sanitary standpoint are ideal and certainly most excellent, but we believe you would agree with us that some of the points are quite impracticable. We earnestly assure you, however, that we intend from this time forth to make all our passenger equipment conform to all practical sanitary suggestions, and that old equipment will be remodeled to meet such requirements as it is presented to the shops for overhauling.

The construction of seats and backs that are removable so as to give opportunity for more thorough dusting and cleaning, has been ordered. It will be further ordered that bevel edges and rounded corners shall hereafter prevail, and your suggestions for better ventilation and exclusion of dust and smoke will soon be submitted to practical experiment.

At the present time the interior arrangement of refrigerators in our dining and buffet cars meet your recommendations, for they are lined with porcelain-covered material and are cleaned and disinfected with formaldehyd at the end of each run.

All drinking waters have during the past year been frequently analyzed by our chemist, and only such as were above suspicion supplied to passengers. In those cities where this company has its own terminals, arrangements have been made to furnish distilled, aerated water for drinking purposes in all equipment.

Your suggestions concerning cleaning and disinfection of passenger coaches which were adopted over one year ago, have been faithfully followed and shall be continued.

We cordially welcome your sanitary suggestions and promise to faithfully obey your commands. Very respectfully yours,

W. GARSTANG,
Superintendent Motive Power, Big. 4 Ry.

We are greatly disappointed at not being able to report that several of our railroads have become specially interested in car sanitation, but hope to be able to so report another year. Very respectfully yours,

J. N. HURTY, Secretary.

DERMATOSIS, AS COMMONLY TRANSMITTED TO THE PUPILS OF SCHOOLS BY CONTAGION, AND MEANS OF PREVENTION.

By Dr. GREGORIO MENDIZABAL, Orizaba, Mexico.

The great advances that hygiene has made in these latter years, and which are due in great part to the remarkable discoveries of Pasteur, from day to day make themselves felt throughout all classes of society, whilst, in a marked manner, they alleviate and improve the condition of man.

By purifying the water we drink, by the sanitation and drying of the soil, by the construction of ample, well-situated and well-ventilated dwellings, by the preservation of the forests, by the drainage of the swamps, by the prevention and punishment of adulteration of drink and food, by building, in appropriate sites and under the best conditions, the prisons, hospitals, barracks, colleges, etc., by procuring the rapid and perfect removal of house refuse, by inculcating the use of the dress adapted to each season, climate, age and profession, by preaching against the vices or excesses that conspire against health and shorten the duration of life, by isolating persons who have contagious diseases, by disinfecting the dwellings and objects that have been used by the sick, before they are used by other people, in one word, by directing the actions of men, both in their individual capacity, as well as in their relations to each other, hygiene fulfills the great mission that belongs to it, of prolonging the life of man and improving his health.

Confining myself to the point I propose to treat of, the result obtained by the isolation of contagious patients, it is surprising to see the benefits man has received by following the wise counsels of hygiene.

Cholera detained and thrown back from the harbor of New York, thus saving from its ravages a country, and, perhaps, a whole continent, is the best defense that could be presented of the efficacy and benefits that man derives from following the precepts of hygiene.

By extinguishing the amarillogenus foci in the regions in which, from time immemorial, yellow fever has prevailed, and by preventing its spread to districts where this disease is endemic and frequently visited by it in the epidemic form, hygiene has allowed prosperity to reach many cities that were formerly devastated by this terrible plague, which everywhere sowed desolation and death.

By recommending the immediate isolation of erysipelas patients in our surgical wards, the process of curing wounds has been greatly simplified and many victims have been saved from the jaws of death.

By preventing the admission in schools of children who are suspected or who really suffer from attacks of some of the infecto-contagious diseases, hygiene gives a guarantee to the families and prevents a slight neglect from carrying death into the homes, or, at least, the pain of a disease there acquired by contagion.

Unfortunately, the human labors that aspire to perfection often have to work slowly. A great deal has already been done in the way of school hygiene; but there is still a great deal to be done before we can reach the point that science aims at.

Even if we are much preoccupied with the diseases that endanger life, we have as yet not fully understood the importance of many others of a milder character, but which, nevertheless, are well worthy our study and interest.

We are all familiar with the cases of dermatosis observed in the schools, and which are acquired, not because they have escaped the provision of hygienists, but rather through the inefficiency of the methods taken to prevent them.

For instance, in the Federal District of Mexico, rules have been issued and put into practice, such as are taught and prescribed by school hygiene, but the medical staff that watches over the application of these precepts is not sufficiently numerous to enforce them as they should be. A physician who has to overlook seventy-four schools of an average attendance of four thousand pupils cannot give the proper attention to the numberless details which could be looked after by a careful inspection of each indivdual, and which would discover many skin diseases that are transmissible by contagion, and whose diagnosis is generally very difficult.

The certificate of health that is required from the pupil in all of the municipal schools does not furnish a complete guarantee, because the physician who gives it, and who generally does so gratis, in view of the poverty of the parties, merely makes a slight and superficial examination that allows him to certify to the absence of any of the diseases most to be feared through their grave character or danger of contagion.

This requisite does not exist in the private schools, and it is in these that we find the most fearful and frequent cases of the transmission of dermatosis of a certain character by contagion, caused by the common life of the scholars in the establishment.

We all have daily evidence of the dermatosis acquired by children in the schools; psoriasis, pityriasis, scurf, tricchosis, favus and many

others that modern dermatology has discovered and shown to be transmissible. It is true that these are not diseases that endanger life; but they are repugnant, dirty and often bring on complications that result in deformities or prolonged suffering.

The means for preventing this contagion are not difficult to implant and unquestionably will give immediate and beneficent results.

We ought at once to increase the number of medical school inspectors, and commission some of them to issue the certificates of health that are required for the admission of children, with a recommendation to give special attention and careful study to the condition of the skin.

This inspection ought to be extended to private schools, in order to further guarantee the community in general, and especially the parents who send their children there for education.

And lastly, with reference to the children of the poorer classes, we ought to oblige the parents to cure them, furnishing them, gratis, with all the resources for the purpose, seeing that these diseases are of a character that easily cedes to a mild treatment, assisted by cleanliness and the most rudimentary principles of hygiene.

SOME STANDARD DISINFECTANTS AND THE CONDITIONS FOR THEIR GREATEST EFFICIENCY.

By Prof. FRANKLIN C. ROBINSON, Chairman, Committee on Disinfectants, Bowdoin College, Brunswick, Maine.

From the standpoint of the sanitarian this may almost be called an era of disinfectants. Where only a few years ago, but a few substances were thought of in this connection, now hundreds of them are offered, and each has its advocates.

In some respects it is like what took place in chemistry at the close of the middle ages. For hundreds of years only a few substances had been thought of as elementary. Salt, sulphur and mercury were regarded as the foundation of all matter, and no one ventured to think of any other elements. But suddenly there was an awakening. Not only were other elements suggested, but the old were disputed. And as a result of that dispute one of them, salt, lost its former position among the elements.

Indeed the analogy is even closer than a mere comparison, for salt, sulphur and mercury held for many years the same position among disinfectants that they did among elements. They were thought of and used as the chief things to prevent decay or arrest it when once begun. But recent years have seen all this changed. They have been attacked as disinfectants, as they formerly were as elements. New substances are offered as better to use in a field which was once all their own; and it is literally true that sanitarians, at the close of this century, are in much the same state of mind about their disinfectants, that chemists were, at the close of the last century, about their elements.

It is important to notice also that both conditions came to pass for the same reason, and that is better and more accurate methods of experimentation. It is what always happens in the study of nature, the more knowledge we get of her ways of working, the more complexity we find. Now there are two ways of meeting this condition; one is to ignore it; to deny that any real progress has been made; to cling to the old because it is old, or perhaps rather because it is easier. The other is to welcome the new with minds not too hasty to pass judgment, but frankly open to conviction, ready to go to considerable additional trouble, if necessary, with the possibility that better results can be obtained. I need not say which of these atti-

tudes I believe to be the one of the majority of this Association. Your work as an association and as individuals shows that what you want is the best thing for sanitary advance regardless of individual trouble.

Now, my purpose, so far as possible in this short paper, is to try and bring a little order out of the confusion. I wish the time had come when more complete order could be expected, but it has not. When I accepted the chairmanship of this committee on disinfection I thought for a time, with the natural zeal of, I will not say youth, but ignorance, that in a year or so it would be possible to make a report which would do for present sanitary work in America what the report of the former committee did for it then. But I soon had to give that up. The work done in this country and abroad during the last ten years has been ten times greater, to say the least, than all that done in previous years; I mean, of course, the work of scientifically testing disinfectants. I found too that there was no summary of such work, nothing which could be referred to to show to what extent any disinfectant, or proposed disinfectant, had been actually tested, and the manner of such testing. So much was this lack felt by the Secretary of the Maine State Board of Health that he had already begun to collect data for future publication, which might be useful to him and others. During the past two years that work has been hastened by him, and I have given him what assistance I could in the matter, but my part has been relatively small compared to his, and to him the whole credit of the work should be given. Fortunately it is now nearly completed, and I venture to say that when it is published, as it will be as a part of the report of our board, you will agree with me in thinking that by it Dr. Young has done more to advance the matter of disinfection than any other man of recent years, whether at home or abroad. I mean, of course, the practical matter of disinfection, the making it possible to know what a disinfectant actually has done and not what its makers claim that it will do.

Unfortunately this work shows, as perhaps was to be expected, that there is a conflict of opinion in many cases, and it emphasizes the need of systematic, impartial work to settle a great many points.

In what I take up in this paper I have had constant reference to Dr Young's paper as well as to the original publications on the subjects.

I use the word standard as referring to a well-known and easily-obtained article. There will hardly be time to consider all disinfectants. I use the word disinfectant with the meaning of "any agent which may be used for the destruction of disease germs," a germicide, in short.

FIRST—THE AIR.

That the air has a certain amount of disinfecting power is well known. Not very much has been said about it, possibly because it is so abundant that there is no opportunity to patent it and thus "push" its use. It owes its action chiefly, if not entirely, to oxygen in some of its forms. The following seem to be established as facts:

That oxygen, at common temperatures and under common conditions, has little or no disinfecting action. It owes its disinfecting power to its property of existing in several modifications, that is, to its property of being changed chemically under different conditions.

Oxygen, of course, is an element and it seems repugnant to our idea of an element to speak of its being changed chemically. The chemical element is supposed to be unchangeable. But chemists have long since carried the idea of fixedness from the element to the atom of the element. Elements are now regarded as compounds of atoms, and hence subject to change like compounds in general. Allotropic forms once so mysterious are now explained in that idea. The same idea makes the once so incomprehensible nascent state reasonably clear of comprehension.

In brief, allotropic forms are different groupings of the same kind of atoms, and the nascent state is the condition of free atoms. Ozone is allotropic oxygen and nascent oxygen is free atoms of oxygen.

Common oxygen has apparently no disinfecting power, but ozone and nascent oxygen have, nascent oxygen much more than ozone.

The conditions, then, under which air becomes a disinfectant are those which produce the most ozone and nascent oxygen. By electric discharge in the air ozone is constantly formed, and probably also by various other natural processes, such as growth of forests, oxidation and evaporation. The air constantly contains a small amount of this, on the average, one part in 240,000. But the office of atmospheric ozone as a disinfectant has probably been much overestimated. It was common some years ago to attribute everything good in the air to ozone. It was regarded as nature's great purifier, and the beneficial effect of sea and mountain air was ascribed chiefly to it.

But tests now show that even when air contains very much more ozone than it does naturally it is far from being a good disinfectant. It seems a safe deduction from experiments carefully made that if the air contained 100 times as much ozone as it now does, bacteria would grow readily in it and the ordinary processes of decay go on unchecked. If, however, it contained 2,000 times as much as it does, or say one per cent. by weight, it would be quite rapidly destructive to germ life, but probably not even then to spore forms in dry condi-

tion. When we further state that air containing enough ozone to make it a good disinfectant is exceeding poisonous to man, we can well believe that ozonized air does not promise much to the sanitarian.

I am speaking, bear in mind, of air as a disinfectant, where it enters rooms, and flows freely over the earth's surface. We know that it acts to a certain extent as a germicide, and I am trying to show why it so acts, and claiming that experiments show that it is not by reason of its ozone.

But if ozone acts very slightly upon dried germs and dried particles, it acts rapidly upon such things contained in water, and the purification of polluted water supplies has in several cases been accomplished by its use. The first of these was near Leyden, Holland, where filthy water from the old Rhine is made sweet and wholesome by forcing through it air containing ozone.

Ozone, then, is a good disinfectant, but the best conditions for its use are that the substances to be acted upon shall be well soaked in water.

Nascent or atomic oxygen is much more active in its germ-destroying power than ozone. This is the kind of oxygen formed when potassium permanganate and such like oxidizing agents break up. It is formed also by the action of reducing agents, such, for example, as liberate-hydrogen from water, which in turn breaks up a molecule of oxygen, seizing upon one of its atoms and leaving the other free, and consequently in the most active form possible.

Ozone really owes its power to this form of oxygen, for it acts by rather easily giving up one of the atoms from its molecule, which is then, of course, in the atomic state. In short, it is believed that common oxygen has molecules consisting of two atoms rather firmly united; that ozone is a three atom molecule which in acting gives up one atom and changes to common oxygen, and that nascent or active oxygen consists of simply free oxygen atoms.

But does common air contain any free atoms of oxygen? It certainly does not for any length of time, for such free atoms are so active that they unite at once with neighboring substances, or in absence of these, with each other to form molecular or inactive oxygen. Behring shows conclusively that such oxygen is formed by these forms of bacteria which produce hydrogen in their growth. He says that the reason why the presence of air kills these is because the hydrogen breaks up the oxygen molecule and liberates one atom, taking the other to form a molecule of water. This atom of free oxygen attacks the germ itself, destroying it. Doubtless some intestinal germs are destroyed in this way. The oxidizing action of metallic surfaces probably is due to the same thing. We know that sur-

faces of platinum especially exert a certain "contact action" upon gases, causing oxidation and sometimes even combustion. In the old so-called "philosopher's lamp" a stream of hydrogen is caused to burst into flame by impinging upon a mass of spongy platinum, though to start with both were cold. For the same reason germs falling upon spongy platinum are soon killed, and the action of a common platinum surface is the same, but not so rapid. Other metallic surfaces possess the same power, but to a still less degree. In experiments made for me by Dr. Bryant, he found that diphtheria germs dried upon strips of aluminum died several days sooner than when dried upon glass or cloth. I express my belief that such action is due to atomic oxygen in some way made by the action of the metallic surface upon the molecules of the air. On this basis a room lined with sheet metal kept clean, that is, made of some rustless composition, or perhaps better still, lined with platinized asbestos, would be self-sterilizing.

The action of sunlight to increase the disinfecting power of air I believe is, for the same reason, the production of atomic oxygen. It certainly is not its heat which acts, and the day of belief in mysterious influences, to account for such positive action, has gone by. It seems to me very reasonable to believe that the powerful ether vibrations of light actually shake apart the oxygen molecules in their path, and they in turn act destructively upon whatever is nearest. The fading of colors, the sunburns upon flesh, are other instances of the same action.

I believe that here is the chief cause of the action of air as a disinfectant, nascent or atomic oxygen produced at the surface of bodies, especially of metals, and produced in very much larger quantity by the action of sunlight. It may safely be said in concluding what I have to say about air, that its entrance and free flow through ordinary rooms does very little to disinfect them unless bright sunlight enters with it, or it has been recently acted upon by sunlight. We speak of the disinfecting action of sunlight—it is really air or oxygen made active by sunlight.

I hope to make further experiments on this matter of action of certain surfaces in contact with air to produce atomic oxygen and hence to disinfect. It is certainly conceivable that something of practical importance may come from such work.

WATER.

Water in the ordinary condition at common temperatures cannot be called a disinfectant, but at or near the boiling point it is a very efficient one.

A mistaken notion has been held that it is necessary to have steam at high pressure and dry to ensure efficient disinfection by it. The facts are that dry steam is less efficient than wet. Dry steam is no better than dry air at a high temperature, and the inefficiency of that is now firmly established.

The outer surfaces of many germs, and especially spores, are quite perfect non-conductors of heat, and unless the heat can penetrate to the interior, death of the germ does not take place. Water serves to soften up the whole mass so that it is thoroughly heated and hence killed.

It is safe to say that all pathogenic germs are killed by a half hour's exposure to boiling water or wet steam at 212° F. This statement assumes that the articles to be disinfected are not in such bundles that the steam or hot water cannot readily penetrate them. In cases of matresses, for an example, the time required would be much longer, say one or two hours. In case of thick bales of goods or rags the time required is so long as to make the process impracticable.

The point I wish to emphasize is that in our search for new disinfectants, and special forms of apparatus, we are in danger of forgetting how much can be done with water and air under conditions readily and inexpensively realized in most households, or provided by the poorest of health boards.

Before leaving the subject of water as a disinfectant I will call attention to the important fact that, while it cannot properly be called a disinfectant at ordinary temperatures, yet it is a powerful, if not the chief factor, in causing many other substances to have disinfecting action. It has been very clearly shown, for example, that such agents as carbolic acid and mercuric chloride (corrosive sublimate), have practically no killing power on germs unless dissolved in water.

Koch first announced that carbolic acid has absolutely no disinfecting action when dissolved in alcohol or oil. Other observers have confirmed this, and the same has been proved of corrosive sublimate by Leüti and others. The solution of these agents in glycerin is equally inefficient unless the glycerin is diluted largely with water.

We are just beginning to see the reason of this in the increased knowledge these later years have brought us of the character of solution in general. We have learned in short that the dissolving of a substance may be a simple making of its particles smaller without otherwise changing them, or it may profoundly change them. As a rule compounds in a water solution are partially broken up, and hence a portion of their atoms are free. These have the activities of nascent elements to a certain extent. Other solvents possess this power of breaking up compounds to a less degree than water, or not at all.

There is then a great difference between corrosive sublimate dissolved in water and the same in absolute alcohol. In the former case the solution contains some free mercury and chlorin, and in the latter none. I do not mean that, in water, the elements are free so that such a solution partakes of the common properties of chlorin water for example, but they are so freed that they are more easily taken from each other's attraction. It is not then mercuric chlorid which disinfects, but mercuric chlorid acted upon by water. Undoubtedly ignorance of this fact has been the cause of failure in the use of disinfectants. Mercuric chlorid dissolved in water may be called active mercuric chlorid, in exactly the same sense that oxygen acted upon by light or a surface of platinum may be called active oxygen.

SULPHUR.

Certain compounds of sulphur in solution have long been known as disinfectants. The chief of these is the dioxid formed when sulphur burns.

It is very important to bear this distinction in mind: That sulphur dioxid by itself, dry, has *no disinfecting action.* It must be dissolved in water to act at all. Its solution in water is called sulphurous acid, hence sulphurous acid is the disinfectant, sulphur dioxid not, or only a very feeble one. It seems to me that it is improper to class sulphur dioxid among gaseous disinfectants of any power. But sulphurous acid may well be held to as of considerable use.

In so far as favorable results have come from introducing the fumes of burning sulphur into infected places, they have been due to sulphurous acid dissolved in water. The only reliable way to use it at all is by previously spraying all the surfaces with water so they will be actually wet, or what seems to me better, spraying the room with a solution of sulphurous acid itself of requisite strength. It is the same kind of action as just considered, that of a substance made active by the action of water upon it in dissolving.

When we remember that it requires, at ordinary temperatures, about twenty times as much water by weight as of sulphur to dissolve the dioxid completely to sulphurous acid, we see one reason, at least, why such conflicting results have come from its use. In brief, if this reasoning is correct one pound of sulphur burned in a room would require about ten quarts of water to make it most efficient.[1] If five pounds are used per 1,000 cubic feet of room space, as is recommended, just about one barrel of water would put this into its most efficient condition. One might as well turn a stream of water from

[1] 1 gram H_2O of 20 degrees dissolves .1 gram SO_2 or .05 S before oxidizing.

an ordinary fire engine hose into a room. Now I do not believe that any such amounts of sulphur and water are needed to reach its maximum efficiency, and that is why I think spraying with sulphurous acid will prove more efficient and more economical than burning the sulphur.

One may just as well expect to get good disinfecting results from dry sulphur dioxid as to get them from an alcoholic solution of carbolic acid.

I am not recommending the disinfection of living rooms by spraying them with liquid sulphurous acid. Its destructive action upon cloth, paper, and metallic objects would be so great that it would probably be as cheap to strip and re-plaster a room as to treat it in that way. I am simply giving the conditions under which it has its greatest efficiency. I hope experiments may be conducted along this line soon.

The recent experiments of Dr. Novy seem to me the nearest to what they should be to test accurately the value of sulphur as a germicide. He made the room walls wet by spraying with water, and still found that spore forms and even the important tubercle bacilli were not destroyed.

FORMALDEHYD.

I have taken so much time at the last two meetings on the subject of this substance as a disinfectant that I propose to say little about it at this time. I have followed the work of other experimenters during the year, and made some experiments of my own. It is, of course, gratifying to see how my original positions with reference to it are being sustained as more and more careful work is being done. A few sincere workers still fail to verify the work of the majority, but the majority is growing all the time.

It is of interest to notice that it is the only gaseous disinfectant we have, which can be used with anything like safety in inhabited rooms. Unlike sulphurous acid it does not require the presence of water to develop its powers, but nevertheless is effective in a water solution also. I do not know whether any experiments have been made with the absolutely dry gas, for however dry it may be produced it finds some water in the air, but when free from all moisture, except that in the air, it still disinfects and with apparently no diminution of energy.

The conditions for its greatest efficiency are simply to have enough of it present. Those of us who first experimented with it were perhaps rather inclined to get minimum figures as to the amount to be used. We felt under some necessity to do this because of its high cost then. But it is much cheaper now, especially in solution form,

and the most conservative authorities say, use from a pint to a quart of the 40 per cent. solution for 1,000 cubic feet of room space, dependent upon the closeness of the room and the time it can be kept closed. The generating of the gas dirctly from wood alcohol is still the cheapest way of using it, both as regards apparatus and materials. In that case one to two quarts of alcohol are used for 1,000 cubic feet of room space, according to closeness and time as before.

I cannot close without expressing to the Association my deep conviction as to the great need of original work on disinfectants in order to clear up some points, if possible, before an attempt is made to make a final report to the Association. As I said at the beginning, we shall soon know from Dr. Young's report in what condition our knowledge is. I know that there is too much uncertainty in several directions to warrant a report such as we all want. The great need is for funds to pay for such work. If the late war had not come on there might have been some attempt made to get a small appropriation from the general government. But the movement was wisely dropped owing to that contingency. Without some such aid there must be still further delay as the depending on private workers is uncertain. It is to be hoped that some light on the subject may be obtained at this meeting.

A METHOD OF PREPARING TEST OBJECTS FOR DISINFECTION EXPERIMENTS.

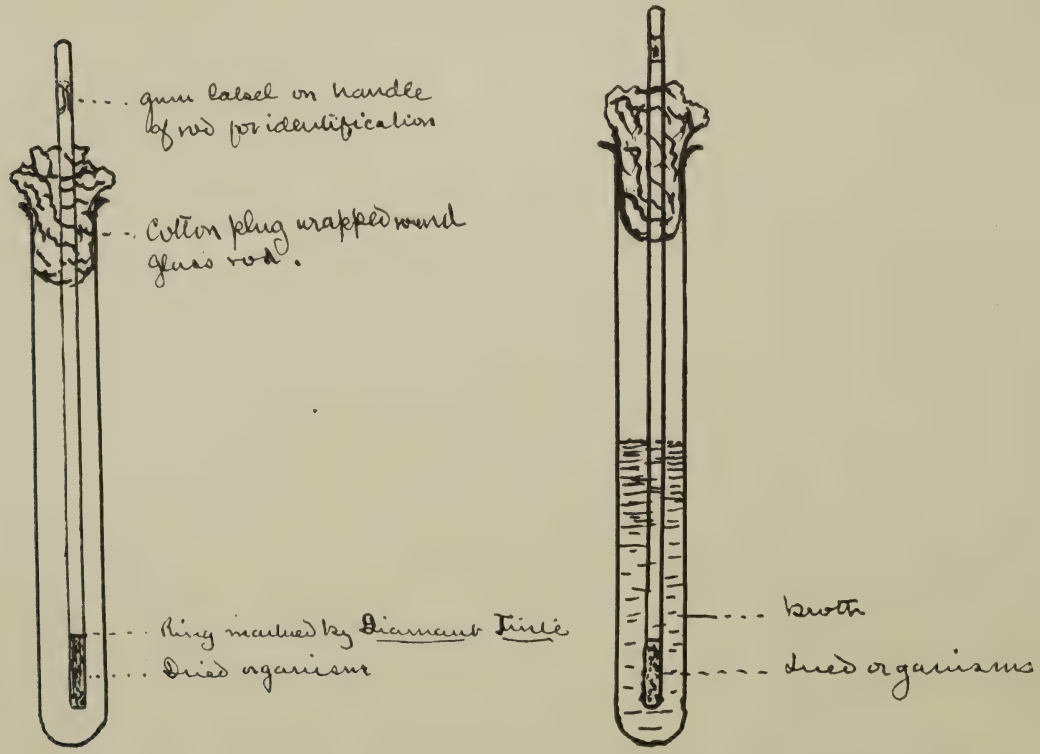
By Dr. HIBBERT WINSLOW HILL,

Director of the Bacteriological Laboratory of the Boston Health Department.

Mr. President and Gentlemen—The modification of one form of bacteriological technique which I now have the honor to present to you, has value only in so far as it compares favorably in simplicity and exactness with the methods now in vogue, excellent as some of them are. I present it rather tentatively, for, although I am not aware of its publication previous to this time, it may be that I have been forestalled by some one, possibly some one here present.

This modification is designed to supply a simple and exact method of testing the action of disinfectants of various kinds, liquid or gaseous, on the different species of bacteria. It is scarcely necessary to recall to this Association the various methods now in use, but perhaps you will forgive me if I make some comparison between these established methods and this new one, if it be new. There is no need for me to dilate upon the very practical character of the work done to determine the antiseptic and disinfectant power of the various reagents which are brought to the attention of boards of health from time to time. Probably every one here has been interested at some time or other in questions relating to the antiseptic and disinfectant efficiency of such reagents, their general applicability and their comparative cost. Where disinfectants are used on a large scale, very close investigation becomes a necessity to every health board which is determined to do the best possible work at the most economical rates.

Of course, the first essential of any disinfectant, before keeping powers, convenience of handling, or comparative cost are considered, is the power to destroy bacteria. Recognizing this, it is the custom everywhere now, for the executive authorities of health boards to turn over to the laboratory authorities new reagents to be tested in this way before the business considerations involved are taken up. Naturally, then, the laboratory methods of testing germicidal power have come to possess a rather wide and definite value, a value more or less definite, according to the care and exhaustiveness with which the tests are made, and the care with which the chemical and physical


gum label on handle of rod for identification
Cotton plug wrapped round glass rod.
Ring marked by Diamant Tinte
Dried organisms
broth
dried organisms
Same rod immersed in broth after exposure to disinfectant.

Glass rod in test tube for use in testing disinfectants. Tube, 6 in. x ¾ in. Rod, 9 in. x ¼ in.
Ring marked with Diamant Tinte one inch from lower end, to show the upper limit of the area on which the organisms are dried. After the exposure the rod is placed in a similar tube containing broth to test development.

properties of the disinfectant are recorded. In submitting to you this design, I am endeavoring to add to our armamentarium in a matter by no means of small moment. The apparatus involved is cheap and always available. A glass rod and a test tube with a little cotton, completes the outfit. The cotton is wrapped about the rod, somewhat towards one end, and the rod is thrust into the tube until the cotton engages in the mouth of the tube: Then the whole thing is sterilized by dry heat. The enclosed end of the glass rod, withdrawn from the tube for the purpose, is plunged into an emulsion, or suspension in water of the organism which is to be tested, grown on solid media. Such an emulsion dries quickly on the rod when exposed to the air for a moment, and the rod is returned to the test tube, where it is safe from contamination until wanted. Instead of using an emulsion of the organism in this way, a drop of sterile water may be first placed on the end of the rod, and a loopful of the organism from a solid culture then be placed in the drop and spread in a thin layer over the surface of the cylindrical end, just as if one were making a smear on a slide for microscopic examination, except that, of course, no stain is used, nor is fixation by heat necessary. Broth cultures cannot be substituted with advantage for the emulsions in water, because broth does not stick to glass very well, whereas the aqueous emulsion does stick, even when only air dried. Again, an emulsion can be made containing very many more organisms to the drop than can be obtained from ordinary broth cultures. This is particularly true for one of the most important test organisms, the anthrax bacillus, and especially for anthrax spores. Indeed, the only satisfactory method of obtaining anthrax spores certainly for testing purposes is by growing the cultures on solid media. The formation of spores in ordinary broth cultures is always more or less doubtful and unsatisfactory. Simplest and best of all, the rod may be rolled on the surface of a solid culture, thus taking up a slight film of bacteria, which dries almost instantly.

It will be seen, of course, that this method is a modification of the well established method of Koch, which consists in drying the organisms to be tested on silk threads. It presents some advantages over the use of threads for these reasons: the rod is large, easily handled, requiring no sterilized forceps, and can be very distinctly labeled, as you see here; then the rod carries a large number of organisms; one can actually see them on its lower end, whereas a thread carries comparatively few. The threads are often a little difficult to sterilize satisfactorily on account of a spore-bearing non-pathogenic bacillus often present on them as they are received from the shop. Moreover, threads must be steamed, whereas glass rods can be heated in a dry

oven simply flamed over a bunsen. Again, a silk thread may absorb into its interstices a few organisms when it is wet, which, when the thread dries, may be more or less protected by the enveloping fibres and may not receive a full and definite exposure to the disinfectant, especially if it be gas. Again, such a thread, if placed in a liquid disinfectant, may absorb and hold some of the liquid, and the washing in sterile water, which should always precede the placing of the thread in media for testing subsequent development, may not remove the last traces of the disinfectant. The same objections apply also to the otherwise excellent method of Dr. Wyatt Johnson, who uses ordinary diphtheria swabs in quite the same way that these glass rods are used. These are perhaps somewhat hypothetical objections, yet their force has been admitted again and again. Indeed, in the Hygienic Institute of Berlin, mineral wool has superseded silk threads for these reasons, amongst others. I think the use of glass rods removes all the objections: it is not permeable, is easy to wash thoroughly free of any adherent disinfectant, and its hard, smooth surface ensures full exposure for every single organism there lying. The use of glass for this purpose is by no means new. Kinyoun used preparations on glass for testing the action of formaldehyd, in the form of coverslips and slides; however, I think this is a less convenient method. Aluminum foil presents some advantages and has been used by Dr. Robinson in his experiments. But it seems to me that this rod method avoids some obvious difficulties in handling, labeling and exposing the organisms, as compared with any other methods so far known to me. I hope to have the criticisms and suggestions of any one interested in the matter.

In the practical use of the rods, they are simply exposed, as would be a silk thread, to the action of any gases or liquids to be tested. They are too big to lose easily and the label identifies each one absolutely, under all circumstances. When the exposure is complete, they are returned to the dry tubes from which they came, and at the first convenient opportunity are thrust into tubes of sterilized broth and incubated over night, the cotton wrapped about them forming a plug for the broth tube, as it did for the dry protective tube previously. The rod may be rubbed over the surface of solid media, if the use of solid media be preferred to that of broth. For testing liquid disinfectants, test tubes are first partly filled with the disinfectant in whatever varying strengths it may be desired to test it, and the rods are thrust into these test tubes and left there for such periods as may be desired. They are then removed, passed through sterile water or broth to wash them free of the disinfectant, and similarly inserted into broth tubes for incubation, or rubbed on solid media if that method is

selected. Neither coverslips nor slides, nor I think even aluminum strips, present such a range of possible application, or require apparatus so commonplace and of such simplicity. We have tried the rods both in testing formaldehyd evolved from pastils and also from aqueous solutions, the results being carefully checked with control tests on silk threads by Dr. D. D. Brough, and have tried them also in testing liquid disinfectants. In both series of tests, they proved very convenient, and yielded results quite as definite and satisfactory, at least, as the results obtained by the older methods. Since these advantages are combined with an exact and absolute exposure of every organism to the disinfectant, it seems to me that the method is worthy of consideration.

METHODS OF TESTING DISINFECTION.

By WYATT JOHNSTON, M. D., Montreal, P. Q.

Bacteriologist to Board of Health, Province of Quebec.

For gaseous disinfectants I have employed with satisfactory results small flat pieces of rubber about one-fourth inch square dipped in a bouillon growth for a suspension of the test culture. The rubbers are placed in small colored muslin bags, the tint of the muslin indicating the manner in which they are to be exposed. Thus red, indicates fully exposed near the spot where the gas is generated; yellow, freely exposed as far as possible from the source of gas; green, lightly covered by a cloth or placed in the pocket; blue, heavily covered, for instance, by pillow, mattress or in a roll of blanket; white, indicates control, not exposed. The muslin protects from dust and contamination while permitting access of gas to the objects. The colors enable bleaching effects to be detected and the small metal clip used to close the bag shows if tarnishing occurs.

The outfit can be enclosed in an envelope and if necessary sent by mail. I have used it since the early part of 1897 with satisfactory results. The main idea is that of having the contact between the disinfectant and the test object as free as possible in the first instance and interposing at will any desired amount of resistance.

For fluid disinfecting I have found that the ordinary cotton wool swabs employed for throat cultures give good practical results, if dipped in bouillon growth or suspensions of the test culture and allowed to dry. After these have been left for the requisite time in the disinfecting solution, all traces of the disinfectant are removed by washing and when practicable by neutralization (for instance, with ammonium sulphide for sublimate, formaldehyde, etc). As the cotton wool swab is a difficult object to penetrate thoroughly, anything which will disinfect it thoroughly may be regarded as sufficient for ordinary sanitary work. It does not, however, permit the contact to be regulated with the nicety attainable with rubber plates, and probably the method suggested by Dr. Hibbert Hill at this meeting of using a glass surface, if combined with some means of regulating the resistance to the contact of the solution and the germ, would be preferable.

Staphylococcus pyogenes aureus is the culture I generally employ. It is an advantage to have an organism not much influenced by drying and not liable to convey infection if carelessly handled. Spores

are not necessary in testing ordinary disinfection, as the organisms we have to deal with in practical sanitary work are not spore-bearing.

An exposure of ten minutes is, I think, a good unit of measurement to adopt in the case of fluid disinfectants.

In expressing results, the number of volumes to which the disinfectant will bear dilution and yet remain effective for staphylococcus aureus in a fixed number of minutes, can be used as a basis for comparing quantitatively the relative strength of different disinfectants. With varying time limits, this factor (S) divided by the number of minutes (M) will give an approximate idea of the relative strength. The formula $\frac{S}{M}$ is, I am informed, only pseudo-mathematical, but its use enables a rough comparison to be made and prevents unfair comparisons of results obtained with different time limits. It provides us a sort of minute unit of disinfection which, like the foot-pound, may be used in calculations. Of course, there is no reciprocal relation between time and strength, as the one cannot be expressed in terms of the other.

Relative cost can be conveniently expressed by the value per gallon of solutions of the standard effective strength (*i. e.*, the minimum strength capable of killing S. P. aureus in ten minutes), a useful practical notion of the relative toxicity of various disinfectants is afforded by the maximum strength in which they can be safely used as solutions in contact with the human tissues. In other words, the strongest solution suitable for surgical purposes. This conveys a more concrete idea than that produced by the statement that O.OOX grms. will kill so many grms. of rabbit or guinea pig.

These methods are some which I have personally found convenient in my own work and are not brought forward with the pretension of being standard methods. A body such as the American Public Health Association would do excellent service, if it could succeed in bringing about an agreement between the laboratory workers on this continent upon standard methods of testing disinfection and uniformity in stating the results. In bringing forward the subject for discussion I had in my mind the idea that a special laboratory committee might be formed, having for its members representatives from as many as possible of our sanitary laboratories, and capable of dealing authoritatively with the subject of standard methods among other things.

The formation of such a committee would, in my opinion, be very useful at the present time.

DISINFECTION IN CITIES.

By ADOLPH GEHRMANN, M. D., Chicago, Illinois.

As our time is very limited, I shall only presume to consider one phase of this subject, namely: That relating to the disinfection of houses for contagious diseases.

In cities, the most unsatisfactory conditions are found. The buildings are not isolated; they are crowded together in the most irregular manner. The construction, in many cases, is very poor, making it very difficult to confine the vapors used in fumigation to the rooms under treatment, or to any particular part of the building.

People in cities do not have as much sympathy from their neighbors as in the country, consequently, during sickness they have no place to go and it frequently happens that they are obliged to walk about the streets until their dwelling rooms are disinfected, and they can return to them. Because of this fact the rooms must be returned as quickly as possible to the tenants and must be in such condition that they can be used during the preparation of the evening meal and for sleeping.

It has been found that practically a limit of from four to five hours is placed upon actual time of treatment of rooms. Under these conditions any method that is used must be capable of fulfilling the following requirements: First, the method must be efficient; second, it must be one that can be easily applied; third, it must be as little injurious to those conducting the disinfection and to the occupants of the rooms as possible; fourth, is must be reasonably cheap

In the disinfection work of the Chicago Health Department various methods proposed have been industriously studied, and it must be said that it has been most difficult to decide upon a method which will fulfill the requirements and meet the conditions as found. From the first introduction of formaldehyd it was especially desired to use this method, because its efficiency seemed so certain. A long series of experiments with various methods of utilizing formaldehyd was conducted, but, chiefly because of difficulties with the apparatus used in its production, none was found which was entirely satisfactory.

At this time I desire to call attention to a method of using formaldehyd that was adopted by the department in March last and which, because of its simplicity and the results so far obtained, seem to warrant its continued use. No special claims are made for it, but it has

been so far demonstrated that the results are equal to those where other methods are employed and more quickly and with less difficulty in the manipulations.

The origin of this method was in the well-known fact that cultures of bacteria can be destroyed by placing a few drops of formaldehyd solution upon the cotton plugs used to close the test tubes containing such cultures. Following out this hint, a series of experiments was made, using various sized bell-jars in which cultures were placed, and formaldehyd was evolved by placing varying numbers of drops of formalin upon pieces of cloth suspended in the air space within. It was found that these cultures were killed in much the same manner as were those where the formalin was placed upon the cotton plug. On the same general plan rooms were then treated and the method as now used was thus developed.

The method is briefly as follows: The room is sealed as usual. Several sheets are hung up in the room upon lines stretched across it. These sheets are sprinkled with the forty per cent. solution. The sprinkling is so made that the sheet is covered as evenly as possible with small drops of the solution, separate and distinct from one another. For the purpose of sprinkling, an apparatus similar to a wash-bottle is used. This has a rubber hand-bulb for furnishing the compressed air; the outlet tube has a rose-sprinkler, with a number of very fine openings. The spray is thrown against the sheet only once—the surface is not gone over a second time. The amount of formaldehyd solution used is not less than one hundred and fifty cubic centimetres per thousand cubic feet. This amount is used because of the experiments of Pfuhl, which show that thirty grammes of available formaldehyd to the thousand cubic feet must be present in order to obtain the killing of bacteria. The time of exposure is not less than four hours and as much longer as the conditions will allow.

Repeated tests with cultures exposed in rooms fumigated in this manner have shown that freely exposed organisms—diphtheria, typhoid and pus cocci—are uniformly killed within the given time, and penetration through one thickness of a sheet or blanket has been regularly demonstrated.

Further disinfection of mattresses and bedding is carried out either by means of the steam van or by sprinkling them with formalin solution and piling them together, so that the vapors may penetrate throughout the mass and reach all parts of it, while the disinfection of the air is in progress.

Finally, in the disinfection of such rooms a combination of methods must be used. Upon the one hand the air space and the exposed

surfaces should be treated by the gaseous method, which may be considered efficient when it will kill bacteria upon exposed surfaces and with some penetration. Bulky objects, requiring deeper penetration, must be sterilized by some special process in which the period of time can be increased and the amount of the germicidal agent used can be more carefully controlled, and certain articles may be treated by immersion in antiseptic and disinfectant solutions.

DISINFECTANTS IN QUARANTINE WORK.

By F. MONTIZAMBERT, M. D., F. R. C. S., D, C. L.,

General Superintendent of Canadian Quarantines.

Mr. President and Gentlemen—The usual hour for adjournment having already passed, I shall make my remarks on disinfectants in quarantine work as short as possible.

Premising that the general disinfecting properties of light, air and sunshine should be fully realized and utilized, I shall at once pass on to the consideration of the more special agents.

And here at once I would desire to emphasize the statement that *steam* is the disinfectant most to be relied on in quarantine work. It is to be employed wherever possible. It is to be used for all articles that will not be injured by it, and for all apartments that are not too large to allow their temperature to be raised above the boiling point by its introduction.

In the disinfection by steam of clothing and effects jacketed chambers should be used. The steam in the jacket brings the degree of the dry heat within the chamber so close to the boiling point that when the free steam is let in amongst the clothing that point is so quickly passed that there is but little precipitation of moisture. The chamber should have a pump or jet for forming a vacuum. This worked at the beginning of the process prevents pockets of compressed air, draws foul air out of the meshes of the clothing, etc., and causes a vacuum into which the steam promptly rushes. And at the end of the process it draws out the steam, so that when the door of exit is opened to take out the effects, there is no steam left to be precipitated on them as hot water, and so prevent their coming out dry. An electric tell-tale thermometer should be packed in the center of each charge. It should ring a gong outside when 212° F. is reached, proving penetration to the center of the packages of the boiling temperature, which destroys all germ life. In addition to this, each chamber should have an electric tell-tale thermometer, with a transmitter in the chamber, and a receiver with recording dial in the boiler room. By these the degree of heat and the time it is maintained are shown and automatically recorded. In this way absolute certainty is obtained, and a glance at the dial shows what each boiler is doing for the contents of its chamber. The temperature should be kept at from 225 to 230° F. for thirty minutes after the gong of the tell-tale ther-

mometer has rung to indicate the penetration of the boiling temperature to the center of the innermost part of the effects. The dials can be subsequently marked with name of vessel and date, and filed for future reference.

Solution of mercuric chlorid should be used for all free surfaces, for containers, and for effects that may be wetted, but not overheated, as leather, rubber goods, oil-skins.

And fumigation by formaldehyd or sulphur dioxid should be used for effects that may not be either drenched or boiled, for compartments too large to be heated to a germicidal temperature by the introduction of steam, and for saloons and cabins where the fixed metal or other fittings and decorations would be injured by the use of steam or mercuric chlorid. As the formaldehyd has no injurious effect on clothing, fur, paper, leather, photographs, india rubber, or metal goods, and as the most delicate colors and fabrics are, as a rule, unaffected by it, it is the surface disinfectant to be used for such effects as cannot be steamed or drenched, and for saloons and cabins which, after they are stripped, still show metal or other fixed decorations that it may be an object to preserve uninjured.

For large compartments, steerages and empty holds of vessels, too large for the use of steam, the use of the sulphur dioxid should, in my opinion, be retained, when it can be driven in from the sulphur furnace under pressure of the exhaust fan. Employed in this manner at the St. Lawrence quarantine station, from ten per cent. to fourteen per cent. of sulphur dioxid has been the ordinary percentage found in the holds of the vessels, according to the distance from the intake pipe. Even the ten per cent, is, of course, greatly more than can be obtained by burning sulphur in a room. And it is a percentage of sulphur dioxid fatal to all pathogenic micro-organisms.

Of disinfectant baths, and the treatment of excreta, etc., in quarantine hospitals, I need not specially speak, as the methods of using disinfectants in such respects in quarantine would not differ essentially from those already dwelt upon for cities and for hospitals by the speakers who have preceded me.

THE DIPTERA FROM A HYGIENIC POINT OF VIEW.

By Dr. ROMAN RAMIREZ, Lacubaya, Mexico.

Professor of Zoology in the Agricultural College of Mexico.

Naturalists have already studied in a satisfactory manner the connection between the diptera and agriculture, and they also understand their direct influence in the creation or aggravation of certain diseases in man, which are collectively designated by the name of *myiasis* and are caused by the presence of the larva of diptera in ulcers or abscesses, or else within the natural cavities of the human body. At the same time, we have comparatively little positive knowledge of the action of diptera in the propagation of contagious disease, although this is a question of great interest in both the tropical and temperate zone, as these insects surround the inhabitants and continually attack them, both in the country and even in the houses.

From some of the observations taken, which unfortunately are very rare, we may infer that as a matter of fact, diptera are active agents in the spread of epidemics and of contagion. These observations, as published by different authors, can be summed up as follows:

In the first place, we must remember that the exterior formation of many diptera, is eminently adapted to the collection of all kinds of small objects on account of the microscopic hairs that cover the body and legs of these insects. Besides these the proboscis of some diptera is thin, penetrating and well adapted for extracting the blood of the mammalia.

It is almost an established fact that the blepharocérides, the culícides, the simúlides, the stomoxys, and the glossina propagate the malignant pustule (anthrax), and it is suspected that by sucking the blood of diseased persons, they can transmit other diseases, such as yellow-fever, and those of a malarial character.

The same may be said of fleas (siphonaptera) and bed-bugs (hemiptera).

Other diptera which are infected, either in their bodies or in the hairs that cover them, spread the germs of measles, scarlet-fever, small-pox, typhus, yellow-fever, tuberculosis, and the plague, the proof of the last having been found in the observations carried out in Hong-Kong and Bombay. We can therefore understand that house

flies could easily propagate other infectious diseases, such as pyemia, hospital gangrene, traumatic erysipelas, puerperal fever and diphtheria.

The rapidity with which contagion spreads among flies through the fungus which is peculiar to them, confirms the possibility of other contagions.

During the spring of the present year, an epidemic of eruptive fevers rapidly developed throughout the whole valley of Mexico, and it was supposed that it principally originated in the sewerage works of the city, and in the earth that was turned up in large quantities for the execution of these works. It is not at all improbable that the flies contributed largely to the development of the epidemic.

Other observations have shown us that certain flies, whilst serving as agents in the fecundation of the plants, also serve as vehicles for the transmission of germs of diseases that attack plants.

The fruits and meats that are exposed to the open air very soon become decomposed, and it has been proved that the flies take part in the process of infection, as it is well known that the decomposition can be delayed for some time by preventing their access to the provisions.

Diptera also transmit the germs that produce the acetic fermentation in alcoholic liquors.

The above is enough to convince us of the importance of the subject under study, but, nevertheless, no systematic and complete investigations have as yet been undertaken of this question, and up to the present date we can only rely on a few isolated observations and presumptions.

Any person who is fairly informed in bacteriology can easily imagine the series of operations that would be required to prove, in a scientific manner, the probability of diptera propagating disease. I have decided to make a personal investigation and assure myself of this fact, and for that purpose have commenced with the simplest part, which is: to demonstrate that some diptera carry on the outside of their bodies germs of different species.

The fact is self-evident, even to the naked eye, as regards the flies which are attacked by *Torrubia*, but it is also true with regard to healthy flies, at least in appearance, because when examined with the microscope and by means of coloring agents, spores, micrococci and other corpuscles difficult to define, are seen among their hairs.

Meat broth and vegetables, beans cooked in Mexican style, milk and the favorite drink of my country, which is called "pulque," are substances that soon undergo alterations at an ordinary temperature. When sterilized according to rules of bacteriology and afterwards

contaminated by contact with house flies, positive results were obtained, as they underwent the same decomposition that is produced in the open air, although more slowly and with less intensity. When I then examined these substances with a microscope, I found them to contain micrococci, bacilli, and sometimes the spores and myceliums of a fungus pertaining to the family of ascomycetes. For this reason, I consider that I am justified in affirming that house flies and the stomoxys calcitrans serve as a means of transportation for some micro-organisms which are capable of reproduction in different substances.

Flies are of a sedentary character, and never of their own accord go far from their place of birth. For this reason and because the larva of the house-fly and of the stomoxys live in the excrement and in the rubbish of human dwellings, we reach the following conclusion: The presence of flies is an indication of the want of cleanliness in the dwellings or immediate neighborhood.

THE SPREAD OF TYPHOID AND DYSENTERIC DISEASES BY FLIES.

By Dr. M. A. VEEDER, Lyons, New York.

Throughout the past summer the writer has made many observations in regard to the agency of flies in spreading disease. It requires but little patience and skill to obtain cultures of bacilli of various sorts from fly tracks and from the excrement of flies. With this in mind, it is not a very pleasant sight to witness flies crawling over the material fresh from the diseased bowel of a patient having typhoid fever or dysentery, and then wandering over articles of food and drink within a few minutes. Where no precautions are taken against the invasion of flies, and where no disinfectants are used upon such material, there is invariably more or less extension of these diseases. Thus, in the suburbs of large cities, typhoid fever is apt to be common, and this is usually ascribed to bad drinking water, whereas in many instances it is really due to shallow water closets which the flies frequent, and from which they spread infection into every dining room and pantry near by. This is the explanation that has been found to be undoubtedly correct in several small local epidemics which the writer has witnessed. Thus, in the case of an outbreak of dysentery of a very malignant type, with forty cases and ten deaths, it was noted that the disease extended from house to house, radiating from a single center, without reference to water supply or anything else in common.

This epidemic, which was strictly localized in a single neighborhood, ceased as if by magic when large quantities of disinfectants were thrown into the closets, and those having the disease were directed to keep solutions of blue vitriol, strong enough to kill bacteria of every sort, constantly in the commodes in use in the house.

This being done, it did not make any difference how numerous the flies were, there being nothing any longer capable of producing disease, for them to load themselves with, and distribute in such manner as eventually to find its way into human stomachs.

An interesting question is as to the distances to which flies ordinarily travel. Judging from the experiences met with during the epidemic just described, and several others of a similar character, the fly does not make long leaps in his migrations. It is a question of a few rods only. Still, when the days are warm and the nights cool,

or when specially sultry conditions prevail, the fly seems to be stimulated to extra exertions. During the day he extends his travels and suns himself, and at night swarms indoors, and we have what is ordinarily termed dysentery weather, when such diseases and typhoid attain their greatest frequency. But it is the buzzing in the pantry that is most ominous at such times. What it means is, that what is ordinarily looked upon as an innocent household pest, is putting poison in meat and drink. It is fly time, and he extends his travels, being attracted equally by food and filth, and so disease and death spread from house to house, through this commingling of tastes on the part of this so-called harmless insect.

It is not a nice subject, but important. There is no doubt, whatever, that camp fevers and dysentery become most deadly in this very way. Water from swamps and shallow wells in alluvial soil may originate diseases of a malarial type, the plasmodium of such diseases being indigenous in this case and not dependent upon accidental contamination. But these diseases, as a rule, are not very fatal.

On the other hand, the sickness that kills comes from the trenches behind the camp, reeking with filth, borne on insect wings. It requires but little commingling of typhoid or dysenteric material to produce an epidemic under such conditions. Soldiers selected for their physical hardihood, and living in the open air, and having plenty to eat, and even the very best of water, develop diseases of this type out of all proportion to their prevalence in the rest of the community, and that, too, in localities previously free from anything of the sort. This is commonly ascribed to the hardships that they endure, whereas those same men in a lumber camp, for example, free from infection, would endure ten-fold the privations and exposure to cold and wet and not only would not get sick, but become more hearty and rugged every day. Nor can the sickness among soldiers be accounted for by dissipation, for they are under greater restraints in this regard than are possible in civil life. And yet they, the flower and pick of the country, sicken and die by the thousand, far more being killed by disease, as a rule, than by the bullets of the enemy.

It is not the carnage of battle, but the pestilence that lurks in the camp that is most to be feared. According to what has been here suggested in regard to the spread of the diseases that attain their widest prevalence in camps, much, if not all, this might be prevented. The first step is to recognize accurately the cause of the trouble and take precautions accordingly. With practically unlimited resources of men and means, such as are to be had in the army, there is no reason why such material as that on which flies fatten should not be so thor-

oughly disposed of as to be made innocuous as well as inaccessible. It is only a question of a few gallons, more or less, of disinfectants daily, and a little extra care in the disposal of excreta.

This may not be quite as showy work as parade drill, but properly attended to, there will be fewer vacancies in the ranks at parade, and so things will be evened up eventually.

It is the man in the stoke hole who does the dirty work that keeps the ship in motion; it is the soldier who looks after sanitary conditions that makes the army strong and mighty. Able-bodied men and not drill alone are required to win battles.

There is no limit to the details that might be introduced into the discussion of this subject.

For example, why should the vicinity of an open ditch be more unhealthy than that of the same ditch when covered? Instances which have come under the observation of the writer repeatedly, tend to show that this is really the case. From the point of view of the present discussion, the explanation is easy. There is a question as to whether much of the sickness in certain southern cities, where open ditches take the place of underground sewers, may not be accounted for on this basis.

A very important point is, however, that burying typhoid material in the ground is no protection against conveyance by flies. Such a mixture of soil and excrement constitutes a veritable culture bed in which the bacilli grow toward the surface, attracted no doubt by the greater warmth from the sun's rays in that location.

There is no doubt that typhoid material can be carried in water, as we hear so frequently these days. But the few notes made from time to time by the writer the past summer in regard to the spread of such diseases by flies have attracted attention in such manner as to indicate that this phase of the subject had not been thought of in any practical way.

Especially has this been evident in the discussions in regard to the prevalence of sickness in the United States army. It is only within about a week that there has been any statement from official sources at all commensurate with the seriousness of the danger. Indeed, there is every evidence that prevailing ideas in regard to it are painfully vague, and that for the most part it does not enter into consideration at all, either in civil or army life.

REPORT OF THE COMMITTEE ON TRANSPORTATION OF DISEASED TISSUES BY MAIL.

By Dr. E. P. LACHAPELLE, Chairman, Montreal, P. Q.

At the twenty-fifth (1897) meeting of the Association, your committee reported: First, that efforts were being made to have the postal authorities of the United States of America consent to simplify the mailing outfit prescribed by them in February, 1896; second, that the Canadian authorities had granted the use of the mails for the transmission of diseased tissues, but that the mailing case was still to be decided upon; third, that the postal authorities of Mexico were, to all appearances, prepared to grant the transportation as recommended by the Association.

At this twenty-sixth meeting of the Association, we beg to report as follows:

Mexico.—A favorable consideration of the principle has been given by the Mexican authorities as far back as the 5th of September, 1896, when they expressed their willingness to adopt, at any time, the mailing case the United States of America would decide upon; the United States Postmaster's order of February, 1896, being evidently not known to them at the time. Their decision is consigned in the following document:

Administration
General de Correus.
Mexico.

Un sello que dice: Secretaria de Communicaciones y Obras Publicas: Mexico-Seccion la Numere 4815. Esta Secretaria creyé conveniente oir el parecer de la Comision de reformas al Codigo Postal sobre la iniciativa de la Asociacion Americana de Salubridad publica respecto de la transmision de sustancias muertas per el Correo, la cual apoya el Consejo Superior de Salubridad, en el oficio que se sirve Ud transcribir à esta propia Secretaria; y al efecto se traslado à dicha Comision el ofisio citado. El paracer de esta es favorable à la iniciativa y el Departamento de mi cargo lo aprueba. En tal virtud manifiesto à Ud que se pondran en practica las medidad propuestas tan luego como le hagan les Estados-Unides y en la form en que se lleven à cabo per aquel pais. Y me henre en communi carlo á Ud como resultado de su refirida communicacion. Libertad y Constitucion-Mexico, Septiembre 5 de 1896. Al Secretario de Gobernacion. Presente. Es copia del original de la minuta que obra en el Expediente respectivo.

C. N. de Jamacoun,
Mexico, Agosto 18 de 1896.

Postoffice Department,
Mexico.

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....

This Department has heard the opinion of the Commission appointed to revise the postal code regarding the transmission by mail of diseased matter—as proposed by the American Public Health Association and approved by the Board of Health. This Department is likewise in favor of this measure and approves of it. Therefore, I have the pleasure to communicate to you that the measures will be adopted as soon as the United States put them into force, in a similar way as carried out by that country, all of which I have the honor to communicate to you in answer to your official letter.

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C. N. de Jamacoun,
Mexico, Aug. 18, '98.

Canada.—The decision of the Canadian Postmaster-General about the mailing case is contained in the following rule, published in the quarterly supplement to the Canadian Postal Guide, November, 1897:

(6) *Specimens of diseased tissue for medical examination.* It has been decided to allow specimens of diseased tissue carefully enclosed in specially constructed double tin cases, closely packed with absorbent matter, and with closely fitting screw caps, to pass by post, at fifth class rate, addressed to provincial boards of health or to public laboratories, where such specimens will be examined in the interest of the public health.

United States of America.—The postal authorities have still under consideration a modification of the mailing case actually used, which modification was submitted to them by one of us (Dr. Mitchell).

Your committee considers its work as now completed and therefore asks to be relieved.

E. P. LACHAPELLE,
For the Committee.

Ottawa, September, 1898.

Members of the committee:

DR. E. P. LACHAPELLE.
DR. HENRY MITCHELL.
DR. DOMINGO ORVANANOS.

REPORT OF THE COMMITTEE ON ANIMAL DISEASES AND ANIMAL FOOD.

By D. E. SALMON, D. V. M., Chairman, Washington, D. C.

Mr. President—Your committee would respectfully report that it has observed with much care and thought the more important events of the year relating to the subjects entrusted to it, and it finds among these some of more than temporary interest to which it ventures to invite your attention.

The researches concerning the etiology of the contagious pleuro-pneumonia or lung plague of cattle have apparently been crowned with success, and this problem which has puzzled the pathologist so long has yielded to improved methods of investigation. The results are of especial interest to us because the micro-organism which causes the disease is so very minute that it remains invisible under the highest powers of the best microscopes. The bearing of this discovery upon future researches is manifest. There are still numerous communicable diseases of which the active cause has remained hidden notwithstanding the active efforts of our most able investigators. We have here another clew to these problems, and without doubt they will all finally be solved by the perseverance and resourcefulness of the modern student. The fact which we must now recognize is that there are living organisms far more minute than the pathogenic microbes which have heretofore been described; and that, indeed, there is a world of life that the microscope is powerless to reveal, just as we have long known of a world that our unaided vision could not detect.

Recent discoveries concerning the bacillus of tuberculosis have served to broaden our views concerning this most interesting and destructive panzoötic disease. From studies of the bacillus of mammalian tuberculosis it was learned that this microbe requires for its multiplication a temperature between 86° and 104° F., and it was concluded from this fact that this germ is an obligatory parasite, unable to multiply outside of the animal body except under the special conditions furnished in the laboratory. Later, it was found that the bacillus of the tuberculosis of birds or avian tuberculosis differs remarkably in its physiological requirements and that it is able to grow all the way from 77° to 113° F. Still more recently a bacillus has been isolated from tuberculosis in fish which grows from 50° to 98.6° F. It is plain that a germ which can vegetate at such temperatures can live as a saprophyte without difficulty if it finds a proper food supply.

The first question that suggests itself is as to the identity of these bacilli, which are so different in their physiological requirements. The researches which have already been made appear to warrant the conclusion that there are no specific differences between the piscine, the avian, and the mammalian bacilli, and that by cultivation for a sufficient time, under suitable conditions, any one of them may be given the characteristics of any other. Familiar cultivation experiments have shown that although the mammalian bacillus at first grows with difficulty and feebleness even upon blood serum, it soon acquires the power to vegetate not only upon this medium, but upon the surface of various liquid media, some of which would appear most unpromising.

Wide, therefore, as is the gulf which separates the cold-blooded carp from the mammalia, or the latter from the hyperthermic birds; great as are the differences between blood serum and acid solutions of various salts; remarkable as are the morphological and physiological differences shown by the bacilli from these different sources, we are forced to the conclusion that these differences are superficial, that they differ with the conditions of environment, and that the tuberculosis of the fish, the mammal and the bird is one and the same disease. Accepting the conclusion that the mammalian bacillus may, under certain conditions, infect fish and be so modified that it has the vigor to grow at a temperature 36° F. lower than before; and that on the other hand it may infect birds and be so modified as to grow at a temperature 9° F. higher than before; that it may acquire the power to grow upon acid salt solutions, and even vegetate in the depth of the culture liquids as well as upon the surface, it is plain that we should be conservative in adopting views as to the existence of distinct and permanent varieties within the group found affecting the several mammalian species. This subject is of great importance to the sanitarian and will no doubt be thoroughly investigated and elucidated within the near future.

As the subject of meat inspection is one which is always of great interest to the American Public Health Association, it is noted that the federal meat inspection service of the United States covered 31,000,000 carcases during the year ending June 30, 1898, as compared with 26,000,000 carcases during the preceding year. This is an increase of 19 per cent. There are still, however, many animals killed for local consumption over which the federal government has no jurisdiction, and there is reason to believe that in some cases animals which would be condemned, if inspected, are sent to abattoirs where no inspection exists, to be slaughtered for local consumption. This tendency increases the importance of municipal inspection under

the direction of local boards of health, and your committee is of the opinion that this Association should use its influence to promote the extension of such local inspection, with co-operation, wherever possible, between the federal and municipal inspectors.

The subject of dairy inspection is still of great interest and all of the problems connected with it have not yet been solved. It is recognized that an inspection of the cows which produce the milk; of the stables in which these cows are maintained; and of the cans and other vessels in which the milk is handled is much more important than an inspection of the milk after it reaches its destination. How to make this inspection over an extended territory often embracing several states, is the problem which confronts many of our city health boards. One should, however, be able to drink a glass of milk in any of our cities without a feeling of apprehension as to the effect which it may have upon his health, and in order to reach this desirable condition of affairs, it is necessary that adequate precautions should be enforced to guard against the infection of tuberculosis, typhoid fever, and other communicable diseases, and to prevent contamination with filth. Some progress is being made in this direction, but owing to the inherent difficulties of the subject and the expense that a thorough inspection entails, this progress has not been as great as could be desired, and your committee recommends that this branch of our sanitary work be given still more attention and still greater efforts in the future than in the past.

It is to be regretted that some recent papers on sanitary subjects have had a tendency to unsettle the views of many, and have furnished arguments for those who oppose a proper sanitary inspection of the dairies. It is important that attention to comparatively unimportant details should not be allowed to obscure the broad general principles which should govern in this work; and it is equally important that the influence of this Association should assist in establishing correct generalizations and sound sanitary procedure.

Our efforts to eradicate tuberculosis from dairy herds should not be relaxed because we are told that sputum bacilli are less vigorous than bovine bacilli, and that the former, in a few experiments, have only produced local disease in cattle. The evidence is overwhelming that the tubercle bacillus easily undergoes modifications much greater than is necessary to transform the sputum into the bovine variety. And if the bovine bacillus is more vigorous and more virulent than the human bacillus, is it not to that extent more dangerous to mankind?

It is not so much a question of protecting cattle from human tuberculosis as it is in protecting people from bovine tuberculosis. Again,

the opposition to the tuberculin test can only be regarded as opposition to all effective work looking to the purging of the dairies of tuberculous cows. No inspector is so expert that he can detect a sufficient proportion of the diseased cows in a tuberculous herd by physical diagnosis alone to free the products of that herd from danger to human health, even if all the animals in which he diagnoses the disease are removed. With tuberculin and physical diagnosis combined an inspector with a moderate amount of experience should be able to diagnose practically all of the cases and eradicate the disease from an affected herd. This being the case, how can we dispense with the tuberculin test if we are in earnest in our endeavors to free our milk and butter supply from this source of danger? Admitting that many of the cows which react are only slightly affected, and we can but accept this fact as an argument in favor of the delicacy of the test. That in some of these animals the disease does not advance and that the lesions become encysted can hardly be accepted as a valid argument against properly disposing of all diseased animals. Tuberculosis is not the only infectious disease in which some cases are mild and tend to an early recovery; but, that fact is not received as obviating the necessity for applying regulations to even cases which appear to be mild so long as there is a certainty that the contagion may be disseminated by mild cases and that a large proportion of the cases which appear to be mild develop into the most severe forms.

Consider for example the case of a badly diseased herd such as is frequently met with in dairy inspection. Suppose the herd contains 100 cows, 75 of these may give a reaction to tuberculin. A physical examination detects the disease in not more than 8 or 10 of the animals, and yet on post mortem examination 25 to 30 may be found so badly affected that they are dangerous to the other members of the herd and to the consumers of the milk. How can the disease be eradicated from such a herd by physical examination and sanitary surroundings if two-thirds of the dangerous cases are retained? And if we can only detect a third of the advanced cases by physical diagnosis, how can we expect by that method to determine the exact time when the incipient cases become dangerous?

With dairy cows quarantine and loss of the milk is impracticable, if not impossible, with a disease of slow development such as tuberculosis. Consequently, there only remains in most cases the slaughter of the reacting cows as the only practical measure of repression. Your committee, therefore, holds that the tuberculin test is one of the most valuable methods of diagnosis known, and that it should be upheld and enforced. It further holds that the retention of diseased animals as foci for the production and dissemination of the contagion

is a condition which precludes the eradication of the disease from dairy herds. It is plain, however, that the tuberculin test, like all other sanitary measures, should be applied with judgment and discretion. If the destruction of cows is pressed too vigorously at the beginning of the inspection, it may drive large numbers of milk producers into bankruptcy and ruin, and raise a storm of opposition fatal to the success of the work. The same result may follow where the inspection is only spasmodically performed or where it can only be applied to a small proportion of the dairies in the district operated upon. Sound sanitary principles should not be lost sight of because we are temporarily unable to enforce them with thoroughness and perfection, and while removing the animals that show disease on physical examination is better than leaving them in the herds, this measure cannot be accepted as all that is necessary for the protection of the public health. That dairy inspection in accordance with modern ideas has its embarrassments and its difficulties may be freely admitted, but these cannot be escaped either by denying the legitimate conclusions of science or by exaggerating the importance of minor details and exceptional cases.

REPORT OF THE COMMITTEE ON "THE DUTIES AND RESPONSIBILITIES OF THE HEALTHY MAN, FOR HIS OWN AND OTHERS HEALTH."

By CHARLES N. HEWITT, A. M., M. D., LL.D., Red Wing, Minnesota.

The first duty of a community is to increase the number and efficiency of the healthy men and women in its population. Sound health is the first essential of well-being or well-doing, for which there is no substitute. It is especially needed in the everyday life of "all sorts and conditions of men."

Healthy people should know that "this inestimable benefit" can be retained, only, by fulfilling the conditions upon which it was bestowed. Communities must learn their duty, and advantage, to make these conditions as easy as possible for their citizens.

There is now no special recognition of this duty, or provision for it, in our community organization. The work of the sanitary service, as defined by law, is to deal with the facts of disability, as if the body was the only part of the whole man to suffer or be cared for, and so it devises and enforces measures for the removal, restriction or suppression of causes of ill-health and disease, and the care of their sufferers, but does not directly concern itself with healthy folk, their increase or interests.

This essay is the contribution of an old health officer and physician to prove that if the obstructions *of social and community origin* are taken away, healthy people will increase in numbers and influence and become the most efficient guides for the rest of the population.

As the matter is one of common concern in which individual men and women are the immediate instruments, it should be treated from a standpoint common to all, and as a matter of business.

That few people are perfectly healthy, more moderately so, and most unhealthy, no one denies. That this proportion should be reversed all admit, while that all men and women were intended to be healthy is common belief. How to help one's self, and others, to be well and to keep so, and how far human help can do it, are, therefore, most important problems for communities as for individuals.

OUR POSITION IN THE WORLD.

Mankind is but one of many sorts of living beings who, together, inhabit the world of inorganic matter and force, and are conditioned

by it, in many ways directly affecting health. Together they constitute a living world, which also directly conditions heatlh, and they condition each other, because they compose a community, an involuntary commonwealth. Man's mental and moral powers enable him, in a limited way, to modify healthfully, the development of some plants, animals, his fellow-man, and himself. They also enable him unhealthfully, but temporarily, to interrupt or pervert natural processes in any of them, to his own or their injury or destruction. In the long run, this community, despite human interference, does its work because, directed by forces, and in ways, as much beyond our full understanding, as our ability successfully to oppose.

The forces and conditions which most directly and constantly affect our health, affect also that of plants and animals, our fellows in this commonwealth from which we cannot divorce ourselves.

Because of these foundation facts our best contribution to personal or public health is to learn obedience, and so adjust our conduct to our environment, as to secure its help, and avoid its penalties.

Science has done more in helping to teach us what these forces and conditions are, and how to use them as means of health, than by her most brilliant discoveries of the direct causes of ill-health. Obedience to the first is largely automatic, in animals and men, and is enforced by experience and observation. By them man learns that if alone, or in community, he constantly avails himself of the service of healthy soil, wholesome water, and the light and the heat of the sun, as his organization and instincts are constantly prompting him to do (and making him dissatisfied if he do not), he will without any necessary knowledge of the why or the how of their help, receive it in full measure.

DEFINITIONS OF HEALTH.

Health is a state of fitness and readiness for natural development, service and pleasure at any period of life from beginning to end. In plants and animals it is, perhaps, chiefly physical, but in man it is also a mental and moral state as well, of the whole man and not of one or two of his organs or powers. The term applies to families or other communities only as they consist of individuals. The proof of its reality, and the test of its quality is the conduct of the whole man in doing the duty, accepting the hardness and enjoying the pleasures of every-day life common to healthy people. It cannot be cultivated or estimated by the demand for, or exhibition of, extraordinary mental, moral, or physical strength or effort, or by special training of any part of the whole man, by itself.

THE HUMAN ORIGIN OF MEN.

The healthy man and woman are the units of the race, each an epitome of common matter under the co-operative direction of all the forces of the world of which they are parts, plus those peculiar to themselves.

Each has a distinct and necessary share in the common life and service as an individual, and together in various forms of association. Their organization and instincts prompt, and no doubt were intended to prompt, healthy men and women to love, marriage, children, and home. The families so constituted are the truest test of the healthfulness and character of a people for the simple reason that they are the beginnings and means of enduring and progressive society and civilization.

If a healthy man and woman, for love, marry, beget children, help them to grow up into independent life, with the fullest education of their whole selves, in the use and enjoyment of normal opportunity and duty, in the family first, and after, in other healthful association, they pay their debt to their race and put themselves in the way of the most complete growth, service and satisfaction of which they are capable.

Healthy people so begotten, and behaving, are the *best-folk*, the aristocracy, of their race, as they are the only human means of its most perfect origin, development, service and duration.

The family is therefore the primary human society. Husband and wife do not make a family (except *"in posse,"* as the lawyers say), it begins with the first child. The family must have a home, the home must be in the homestead (land, buildings and furnishings, the property and living-place of the family), which in its own interest the community ought to make possible to every family willing to earn it.

The privacy and independence of the healthy family is essential to its every-day service; the life of the individual begins there: for years his care and education goes on there, ceasing only when transferred from his father's house to his own. The relations and reciprocal duties of parents and children develop there: it is the first school and the last one for healthy folk, in which no scholar ever graduates and parents are pupils with the children. The masters and teachers are the forces and conditions greater than either, for whose service in man's behalf the family affords the natural opportunities.

Communities and society other than itself, find in the healthy family their type, and in the communal necessities of such families their excuse, while their rights are the concessions of the families of which they are composed, for mutual benefit.

The community admits this derivation by its estimate of value of children in the care and education which it provides at public expense. Society, for the same reasons, promotes associations of well-known sorts. Both are useful, but always as subordinate, and supplemental to the *healthy* family which neither can supplant.

For the children's sake communities and society should know that to help increase the number of healthy families, in their own homes, is the best they can do, and co-operation with the mothers in healthy homes is the most direct and helpful way to do it.

Forgetting this fact or disbelieving it, some "practical" philanthropists and social reformers, of their own sex, find it hard to understand why the mother, whose ways are so often not their ways, should be left to manage her children, and conduct her family without their assistansce or direction. It would be better and more tactful to put necessary things and opportunities within her reach and leave to her the responsibility for their use, than to attempt to direct her, relieve her of the natural responsibility, or force or permit her to surrender her natural right or duty under the forms of law. With exceptions, which readily occur to anyone familiar with the facts as they are found in daily life, this interference on the specious excuse that it is for the good of the child, has worked so great wrong that it is questionable if the benefit to the few counterbalances the injury done to the many. The natural way is to hold parents of children (legitimate and illegitimate), to the responsibility which they have assumed, and doing only what is found to be necessary to enable or compel them to meet it.

The view here taken of social and community organization and service assumes that *their most valuable members are the healthy in families,* that they are the most capable of helpful service, the surest bread-winners, and carry the heaviest share of others burdens. It might, with justice, be claimed that they are taxed without proportionate representation, in the government and expenditures of our average communities, where they are outgeneraled, if not outnumbered and outvoted.

It is not the purpose of this paper to discuss the causes of the pauperism, disease, vice, and social disintegration which modern society, politics, and "business" have put up against the natural causes of sound health, wholesome thinking, and conduct, in every-day life, nor to study the remedies, or other palliatives and disguises proposed or used against them. It would be profitless to inquire if the modern Sisyphus has any better methods or any better luck than his ancient prototype. No such labor as his confronts the workman who follows the lead of the real causes and conditions which Nature reveals to healthy folk in the ways we have noted. The most impor-

tant of the means available for the healthy man to preserve his health are easy to know, and if the way is open, not hard to use. The obstacles in the way are largely of human origin, and not insurmountable if other healthy men will join in the effort. There is no mystery about them except the steady persistency with which the average community maintains them, and the failure of most people to join heartily for their removal. From the standpoint of healthy folk to seek how to increase their numbers, usefulness and satisfaction by a study of ill-health, vice and disability among their victims, would be like an attempt to discover what are sound mind and morals by living with the depraved and insane.

A natural and easier way is to assume that sound health is the birthright of every one born into the world, without which he will be heavily handicapped in the race he has to run there; that he has the right to every reasonable opportunity and assistance to retain his health; that every removable obstacle to such opportunity is a common bar to all other healthy people, and its removal a common duty; that removal is always more difficult than prevention, so that to keep healthy people well and efficient is "as a business proposition," a "money saving scheme" worth the attention of people and communities whose first question as to any measure for public good is as to "the money in it," and next, "Where do I come in?" For those who take that "practical" view it will "pay" a better saving of money than to deal with disabilities and their consequences as is now done, by winking at their existence, or palliating natural penalties by what is falsely called charity and correction. For where so large a proportion of incapacity, dependence, bad thinking and bad doing are the consequences of deliberate violation of known natural and human law, there is no other more just and necessary public duty than to insist that the one who so disobeys suffer the inexorable penalty, for the common good, and with no other help from his fellowmen than charity and sympathy, guided by common sense, suggest.

Fortunately, health is not entirely dependent on our scientific knowledge of its conditions, upon the will of the majority, or upon laws or other checks of our devising, any more than seedtime or harvest, the existence and increase of our flocks and herds, or the regulation of the weather.

The family, social and community disabilities against which we legislate, and organize social resistance, are of two sorts, both confessed by such action, to be of human origin. They are:

I. Those which the sufferers cannot avoid and for which parents, family, other teachers, the community or "business interests" are re-

sponsible. Against these the victims have a claim upon other men for assistance and protection.

II. Those for which the individual is responsible for himself and as a member of society.

The division is an artificial one but handy, as it can be made in most cases with enough accuracy for use in courts. But there are a considerable number of disabilities—departures from what anyone would call "reasonable" health—difficult to assign to any particular account, and it is possible to juggle with any of them (See current criminology and sociology).

If we judge them as bars to the *healthy doing and enjoying of every-day duties and pleasures,* it is easy to see that the most serious of those for which men and women are to blame are directly caused by the violation of conditions that anyone of ordinary intelligence, among civilized people, instinctively knows to be right or from common observation, experience and instruction has learned to be sensible and necessary.

It is well known, too, that the largest part of the disabilities which man inflicts on himself, or upon others, is caused by the violation of fundamental instincts and powers of which Nature permits no healthy man or woman to be ignorant, those most essential to personal development and to social and community organization. For the reasons here suggested, and implied, healthy people in family are essential to community and society as their most efficient means of public health.

Aside from the grand service which their presence and example naturally afford, it must never be forgotten that they are a part of the provision which Nature maintains without human assistance, and despite much human resistance, constantly in evidence, as a leaven to leaven the whole mass in her good time. She has put it in our power to assist her if we will.

Of the serious obstacles which men oppose to her work and help there are some which must be mentioned because they are directly in the way of health. Hardly a reference is needed so familar are most people with the facts and their malign influence.

Some men and women civilized, educated, Christian and cultivated, (I use the adjectives they apply to themselves), teach by their example, whatever they may say or write to the contrary, that even for healthy people marriage, if at all a natural law, has many exceptions, as it interferes in various ways with personal liberty, is, any way, a lottery; often bars from nobler and higher ambitions and pursuits, and culture; is at best a sort of physical slavery, for the maintenance of the race, which, if it were not for legal divorce, would be an intolerable

bar to that freedom from mere physical restraint, which the truest life of our time demands. This and more is claimed, even when marriage is childless. The objections are, of course, more serious when the possibility of pregnancy is considered, a condition of increasing danger and inconvenience, for so many weary months, with the horrors of childbed and nursing as the conclusions of it all. It is not difficult to understand how an increasing number of women persistently educated to such views of the effects of natural processes, more by their own sex than by men, are persuaded to postpone, to prevent, or even to destroy. So many disabilities of women are attributed to these events, and to other functions as essential healthful, regular and important as digestion, that a veritable multitude of women submit to mutilation, which no man in parallel circumstances would consider for a moment, or permit.

There is a decrease of healthy people, in the centres of population, who marry; there are many unhappy and unfruitful marriages; the number of children to a marriage is decreasing, so that even nations are trying in various ways to forefend their extinction by the increasing death rate as compared with the diminishing birth rate. Secret vice and prostitution are not decreasing, nor are the diseases and disabilities attributed to them. It seems as if the type of fevers was becoming less distinct, and the number of uncomplicated and complete recoveries is no greater.

The nervous system (the brain and its outposts), is having a greater share of the stress and wear even in common life, and a very large proportion, in the life of certain classes of men and women. The disabilities from "neurasthenia" to madness on the mental side, and from debility to exhaustion on the physical side, with feebleness, lack of vigor and "snap" on the moral side, make up a picture of ill-health which, from the standpoint of palliation or cure, is discouraging enough.

From the point of view taken in this paper—that of the healthy—these things are the commonplace penalties of the violation of natural law, which can only be avoided by obedience. Nature is surely weeding out the disobedient. Those who will not understand this, and see only a dark future, in which worse is to follow, foreboding the ruin of society and even the destruction of the race, are, in the light of what we know, fools, even if honest, increasing evil by the ghosts of their false conclusions, and helping pessimism, when courage, hopefulness and helpfulness are needed. Much of this discouragement has come by studying this subject from the unhealthy side unhealthfully. The only sensible and business point of view is that of

the healthy, and the chief end of effort should be the prevention of evil by the increase of those who do well.

Unite with healthy folk by "keeping your feet on the ground," and studying these problems as they affect our common life, recall the conditions of such life to which we have referred, the constant and ready help we can get from them, and the evident purpose of Nature that we should use them, in the light of the healthy instincts and reasonable common sense, given us for that purpose.

As for "work for others" (the current fad), there is but one healthy way, which is to begin it for yourself first, then for "those of your own household," and lastly for others. The teaching of health should begin by example—be healthy yourself. It is the only method which cannot injure the teacher or the taught.

The most successful teacher has always been the one who, being what he teaches others to be, needs little apparatus, cultivates no "specialty," avoids publicity, does not write voluminous literature, and deals with the *conduct of every-day life.*

The teacher referred to is the healthy man or woman living the daily life common to us all. The qualities required are the homely virtues which find their origin and first field of exercise in the family, whence they go to other families and people as silent infections. They are so largely instinctive and so intimately associated with personal and private life that there is no other school for their teaching, nor other association where they become so readily habits of thought and conduct. It is a curious but easily understood fact that in a healthy home the best ensample and teacher of these virtues is the wife and mother. It is a strange commentary on this fact that the healthy mother who has done all this and made her home healthy and happy by her deeds and her silence, who is no more able to put into technical language her principles and methods of culture than to tell any one else how her cooking and nursing are the satisfactions her family and friends know them to be, is brought "to book" for "false methods" or "lack of progress" by other women, who never had a family, or if they had, failed, by the homely test which proves her worth.

One cannot be justly accused of impugning the motives of many now prominent in efforts for the reform of homes and children, in saying that they neglect to take account of the primary causes and conditions of life and health which we have noted, or of the family as the natural means of adjusting adults, as much as children, to them. They seem to have forgotten that the family is an institution of Nature and not of man's devising, that it is not a machine shop, nor a public school, nor a voluntary association with a written consti-

tution, by-laws, or elective officers; that it does not publish its proceedings, nor discuss its business in public assembly, nor declare its opinions or intentions, by written resolutions. It is in fact, the best example we have of a close corporation, in the highest sense of the term, in that its laws are written in instinct, affection, and conscience, and least of all in the conclusions of science, or the calm dictates of reason.

The healthy family defies analysis. If one permitted a scientific dissection of its origin, motive and methods the result would be like that for the color, beauty or perfume of a flower to reproduce them, or to find the functions of the mind by the scientific destruction of a healthy living brain. There is something which eludes search and dies in the process.

Ask the healthy lover, Why? Ask the healthy man and wife, Why? Ask the healthy mother who lives in the affections of her family, Why? Ask yourself what are the helps and consolations that you find the most satisfying and enduring in your daily round of service, and see if the answer comes from the side of reason or scientific knowledge or from instinct and affection, which you cannot if you would, and would not if you could, analyze, or figure and balance as you do the facts of your ledger.

There is no other conclusion to the train of facts and thoughts which we have followed than that which we find down in the heart and experience of healthy folk, that the primary forces for sound health—the disposition and ability to do one's duty for the right and the pleasure it affords—are beyond our control, but within our reach, and at our service if we will, and try. There has been, and still is, enormous loss in those who go down in the opposition, for their own or other's blunders, neglect or disobedience, bringing upon healthy and unhealthy the penalties we have noted. The keener our realization that these disabilities are preventable will be our disposition to use for ourselves and induce others to use the means to that end. The difficulty now is that the measures tried are oftener attempts to evade, disguise, temporize, or palliate the evils attacked than to prevent their occurrence by removing their cause. There is an increasing inclination to work reform by associated effort and to try methods upon other than ourselves, our families or our kin. There is a practice of putting the observer, student, reformer, professor, "expert," etc., outside the subject, as if he or she was not of like organs, passions and temptations with the poor creatures under dissection and treatment. There is a sort of *"ex cathredra"* tone, too, and manner, as if the last word had been said, as if the prescription was based upon a profounder study and experience than the evil-doer could possibly

have. This is enough the case to be harmful and to prejudice many good as well as bad, unnecessarily.

The natural way to escape this artificial character in such study and prescription is to stop treating human life and conduct as if they were disease, and its consequence to be dealt with by remedy and anodyne.

There are, in every community, healthy people and healthy families, as there are sick people and sick families. These healthy people are in all classes of the population, but most among those who labor with hands and brain for a daily wage with a limited income, and who find satisfaction and real culture in the experience and education which such life affords. There is no lack of opportunity for the growth and use of the highest qualities of the whole man in such lives and homes. Here is opportunity for healthful and wholesome study of what such persons and families really are. There is no danger of other than healthy infection here, no risk of smirch of mind or body by association with evil.

We need more records of healthy people and of their work and pleasure, and fewer of the unhealthy and the spread of their infection. The study of the first is the best antidote to the morbid influence of the last. It puts *healthy people in families* where they ought to be, as the practical commonplace ensamples for other people, it will surely lead many to imitate. The community must in this way be taught that in proportion to the number and efficiency of healthy families will be the reduction in the sick and death rate, the decrease of the dependent and vicious, and so the reduction of expense for their care or control, an increase of income not only of money and material advantage, but of vigorous life and service.

Another advantage of this way of dealing with what are called "the problems of our time," (though they are as old as the race and always will be "problems") is that in attempting to solve them in practice the individual and family are the means and their daily well-doing the methods, so that no one is so insignificant but that he or she may find opportunity to study and help to solve the knottiest problem of them all, and to be an example of its solution. That failure comes so often is no cause for discouragement. One of the evidences of sound health is the ability to endure hardness, for life consists in perpetual resistance to death, and so the test of manhood and womanhood is successful resistance to ill-health, of which the proof is the conduct of the whole man in every day life. Hardness is a means of culture, which is always needed; no one fails so often as he whose careful guardians have shielded him from just this trial. No healthy child can grow up into healthy maturity unless

that growth has been stimulated and toughened into masterful helpfulness by a ceaseless fight with temptation to surrender his birthright for a mess of pottage.

I conclude this paper as I began: The first duty of society and communities is to help the increase in number and usefulness of healthy men, women and children in families who own and live in their own homesteads, doing the work, accepting the hardness and enjoying the pleasures of the every day life common to healthy people.

That something more than this accomplishment is possible and desirable is not questioned, but whatever that something may be, it must supplement, and not replace, the life and conduct common to all healthy folk.

INFECTED MILK SUPPLY.

By BENJAMIN LEE, M. D., Health Officer of Philadelphia.

The fact of the frequent transmission of typhoid fever by milk is no longer questioned by the most skeptical of family practitioners. The number of instances in which scarlet fever has been traced to the same source is not small. But with regard to diphtheria the case is somewhat different. Well authenticated instances of such transmission of that disease are extremely rare. The following history, therefore, which I consider presents conclusive evidence of the possibility of the occurrence of this accident, viewing the subject from whatever standpoint, possesses decided value.

On the first day of May last I was summoned to the telephone by Dr. Robert L. Pitfield, one of the assistant bacteriologists of the State Board of Health of Pennsylvania, residing in Germantown, a suburb of Philadelphia, who informed me that he was seeing in his own practice and in that of other physicians by whom he had been called in consultation, a considerable number of cases of diphtheria in the families of well-to-do persons in no way connected with the other and having no visiting relations. The only possible feature which they possessed in common was the fact that they were supplied with milk by the same dairyman.

I at once telephoned to the chief medical inspector of the Philadelphia Board of Health, Dr. J. Howard Taylor, by whom an inspection of the dairy was immediately ordered.

The following is an extract from Dr. Taylor's report to the Board:

"'Blue Bell Hill' is a small settlement at the west end of Walnut lane, near Wissahickon avenue. The streets are without pavement and proper grading, and slope towards the southwest. B—'s place is near the summit, with a sharp declivity through the yard and stable to an open gutter in the rear, into which filthy surface drainage from the stable-yard and two overflowing privy-wells is discharged, and carried through a small stream to the Wissahickon and thence to the Fairmount pool. At second house north of cow-yard and adjoining, there were two malignant cases of diphtheria last December, and at this place is an overflowing privy-well, which discharges its filth whenever it rains over the surface of the cow-yard, and into the open gutter. The cow-stable is unavoidably filthy and the straw and corn-stalks on which the cows lie are frequently saturated with this filthy

drainage, thus soiling their udders, and fouling the milk with dirt rubbed off during milking.

"From the twenty-second of March to the thirtieth of April but six cases of diphtheria were reported from the Twenty-second ward, none of these in families served by B— with milk. From the thirtieth of April to the sixth of May twelve cases of diphtheria were reported from the Twenty-second ward, all of which were in houses where B— served milk. Promptly with the report of these cases, a quarantine was placed on the premises and the sale of milk prohibited."

At my request Dr. Pitfield was permitted to accompany the inspector and bacteriologists of the City Board and to take part in the investigation.

The following statement of the bacteriological evidence afforded by the milk is from his pen, and is extracted from a paper in the *University Medical Magazine*, published in Philadelphia:

"On the second of May a sample of milk was secured from the dairyman and studied bacteriologically. Cultures upon serum were made from the milk, and glycerin-agar plates were poured from it. Also a guinea-pig was injected with it. In a scraping from the serum-tubes a copious growth of streptococci was found, and here and there sparsely distributed were small curved bacilli, bizarre and clubbed in outline, and exhibiting here and there metachromatism with Lôffler's blue. Secondary serum cultures made from these tubes failed to isolate the diphtheria bacillus; and from the agar-plates as well.

"Twelve hours after the guinea-pig had received a few cubic centimetres of milk in the abdomen it was dead, and a post-mortem showed rapid pus-formation, septic peritonitis, etc. Microscopic and cultural examinations failed to show the diphtheria bacillus, but many streptococci were seen and isolated, although in the interior of some of the leucocytes bacilli resembling the Klebs-Lôffler organism could be seen. While the presence of the diphtheria bacillus could not be proved in the milk, yet, since every diphtheria case had used it and every case had streptococci in its throat, the inference is plain that drinking the milk was the cause of the diphtheria.

"Besides the diphtheria cases, many adults suffered from acute infective tonsillitis with exudation in the crypts of the tonsils. Cultures from some of these throats showed numerous streptococci. All of these adults drank Blue Bell milk. Milk must be considered an important etiological factor in tonsillitis; cows often suffer from mastitis; one form of this trouble is caused by a specific streptococcus, which is non-pathogenic to guinea-pigs; they might easily have a mastitis caused by the streptococcus pyogenes, which is pathogenic

to guinea-pigs. Through the courtesy of Dr. Case, of the Philadelphia Health Bureau, I was enabled to compile the following table, giving all the cases reported to the health office:

DATE.	NAME.	MILK.	SCHOOL.	STREET.
March 22 to April 29	Salmons	C——a	St. Luke's	Rittenhouse.
	McDevitt	McC	None	Osceola.
	Patterton	Flourtown	St. Michael's.	Magnolia.
	Cook	Correa	Catholic	Centre.
	McSpar	H——g	Keyser	Morris.
	Edds	Fern Rock	Centre	Penn.
April 30 to May 7	Hen. S	Blue Bell	None	High.
	(Culture)	" "		
	E. Shaw	" "	Calvary	Morris.
	(Culture)			
	O. D	" "	None	Knox.
	Carlile	" "	Friends	Harvey.
	(Culture)			
	Murphey	" "		High.
	D——r	" "	No. School	Washington (W.)
	Wells	" "	None	E. Washington.
	(Culture)			
	Wells	" "	"	E. Washington.
	(Culture)			
	Wells	" "	"	E. Washington.
	(Culture)			
	H'y's	" "	No. School	E. Washington.
	(Culture)			
	J——n	" "	St. Vincent's	Stafford.
	(Culture)			
	Harris	" "	None	Walnut Lane.
	D——s	" "	"	Walnut Lane.
	(Culture)			
	L——tt	" "	13th & Race.	Wayne.
	Myers	" "	None	Nash.
May 8 to May 15	Clax	McIll	None	Newhall.
	(Culture)			
	Bach	H. and S	"	Wayne.
	(Culture)			
	Whitney	Blue Bell	"	Johnson.
	Carlile	" "	"	Harvey.
	(Culture)			
	Orbison	H——g	"	E. Duval.
	(Culture)			

"Immediately after finding that all the cases of diphtheria reported in the first week in May had used Blue Bell milk, the Philadelphia Board of Health ordered the dairy closed, and began an inspection of

the premises. Upon the Board's invitation, I took part in the investigation. All of the cows were carefully examined and no signs of disease were discovered, either on their teats or udders or elsewhere. The milk-house was clean and very neat.

"From the fact that the epidemic began sharply in the end of April and was limited in extent, it hardly seems possible that any infected milk-ducts or teats could have been the cause of the outbreak; but rather the milk was probably infected from some source outside of the cow's bodies and for a short period only. The Klebs-Lôffler bacilli falling into the milk, perhaps only a pail full of it—milk being an excellent culture medium—the bacilli rapidly increased. It is quite possible for cows to have a cutaneous diphtheria of the teats or of the milk-ducts. Diphtheria of the teats, according to Dr. Lennox Brown, is known in England as 'chapped teats.'

"Cultures were made from the throat of the dairyman, who two months previously had had a quinsy. These proved negative. From the throat of his nephew, aged 2, Klebs-Lôffler bacilli were isolated. There were no clinical manifestations of the disease, however, in the throat, the only lesion noted was a pair of swollen tonsils, which did not look very much inflamed. Moreover, he had not been sick; then, too, he also had drunk the milk and may have thus become infected.

"Drs. Case, Pease and Bemis, of the Health Bureau, investigated the premises. A simple survey of the stables, interiorily and exteriorly, showed them to be extremely unhygienic. The bedding was plastic with dung and there were insufficient light and much dust.

"The stables were built at the lowest point, in a little dale, and the drainage overflowing from the privies round about, because of gravity, must soak through a stock of fodder outside the stable and the bedding inside. After percolating through the stables it could be seen oozing out into a vile-looking run, from which intolerable odors arose.

Three weeks previous to the inspection a malignant case of diphtheria had developed in a house close by. All the slops from the sick-room were cast into an overflowing privy, and the drainage overflowing the ground ran down a slight incline into the fodder and stables, impregnating the bedding of the cows and food with, perhaps, diphtheria bacilli. The udders of the cows, as they lay on the litter, may have become infected and the bacilli may have fallen into the milk during milking.

"Besides the presence of the Klebs-Lôffler bacilli in the throat of the child and the foul drainage in the stable, another possible factor in the contamination of the milk was a sick chicken in the dairy-yard.

Clinically the fowl had true diphtheria. False membrane, most typical in appearance, was found in its throat and nostrils."

It will be seen from the foregoing statements that no link in the chain of evidence fastening the responsibility for the causation of this localized epidemic on the dairyman is wanting. We have, first, the sudden outbreak of diphtheria, almost simultaneously in different families of citizens in easy circumstances, living in houses, the sanitary condition of which was good and the environment salubrious. Secondly, the fact that the disease could not possibly have been carried from family to family, occurring, as it did, in the practice of several physicians, and the families not being acquainted with each other. Thirdly, the fact that the bedding of the cows was saturated with filth containing human excrement in a very slightly diluted condition. Fourthly, the fact that the udders of the cows were smeared and plastered with this filth. Fifthly, that undeniable proof was produced that this filth could easily have been contaminated still further by the germs of diphtheria from a neighboring house farther up the stream, which ran through the barn-yard. Sixthly, the discovery of the sick chicken in the stable with the diphtheritic membrane in its throat; and seventhly, the presence of streptococci, both in the milk and in the throats of all the children who had diphtheria and had also used milk from this dairy. The fact that the diphtheria bacillus was not isolated unmistakably in the specimen of milk examined cannot be held to invalidate the chain of evidence. The lesson to be drawn from this incident is the essential importance of the frequent inspection of dairies, as well as of milk, in order to guard communities from the introduction of disease by means of that universal article of food. Inspection of milk alone is but a half measure, and may lead to a false sense of security.

PREVENTIVE ANTIRABIC INOCULATION SERVICE IN MEXICO.

By Dr. EDUARDO LICEAGA, of Mexico.

The Antirabic Institute of the Supreme Board of Health was opened to the public on the 23d of April, 1888, since which date the Pasteur treatment has been applied to 2,700 persons, up to the 30th of June, 1898.

Of these persons, the following were inoculated:

By animals undoubtedly hydrophobic	209
By animals probably hydrophobic	1,532
By suspicious animals	814
Total	2,555

The balance consists of persons who submitted themselves to the treatment, simply as a measure of prophylaxis, or who abandoned it without receiving more than the first series of injections. The Board has no knowledge of more than seven persons who succumbed in spite of the treatment; which gives us a death rate of 0.27 per cent.

Of these persons who succumbed, two had made timely application for the treatment and went through the whole course without any interruption, but died fifteen days after its termination: one applied for the treatment after the lapse of sixteen days, one three and a half months, and one ten days from receiving the bite; whilst of the two others, although presented within the proper time, we have no certainty of their both having proceeded from hydrophobia, and besides that, like the three preceding cases, they died before the lapse of fifteen days from the termination of the treatment.

If, as is customary in institutions of this character, we do not count in our mortality statistics, the persons who in spite of the treatment succumb within the fifteen days following the end of the treatment, the mortality among the persons treated in our institute is reduced to 2 in 2,500 cases, or otherwise, 0.08 per cent.

In Volume XI of the "Annals of the Pasteur Institute, No. 425 of April, 1897, at page 337, we find from 1886 to 1896, 18,645 cases were treated, resulting in 90 deaths, equivalent to 0.48 per cent.

In order not to extend this paper unduly, we do not transcribe the statistics of other institutes, but we find in them all that the rate of mortality is more or less the same as in the Institute of Paris.

Note: Dr. Eduardo Licéaga presents this memorandum to the Association, having extracted it from a paper by Dr. Ismael Prieto, assistant in the Bacteriological Laboratory of the Supreme Board of Health of Mexico.

REPORT OF SOME OF THE MOST IMPORTANT PAPERS PRESENTED AT THE FOURTH CONGRESS OF TUBERCULOSIS, HELD IN PARIS, JULY 27-AUGUST 4, 1898.

By E. A. de SCHWEINITZ, M. D., Washington, D. C.

Director Biochemic Laboratory, Bureau of Animal Industry.

At the last meeting of the American Public Health Association, held in Philadelphia, in October, 1897, I had the honor of being appointed a delegate to represent the American Public Health Association at the fourth Congress for Tuberculosis, which was to be held in Paris in 1898. I had made all plans and preparations to attend this meeting, but the unexpected generosity of Congress in making an increased appropriation for some of the work under my charge, prevented my carrying out my intentions. I had even engaged a stateroom on board the steamer of the French line which sailed from New York on July 2, and had cancelled the engagement only about ten days before this date. Had I been able to make the trip as I expected I would probably have shared the fate of the other passengers on the Bourgoyne and at present be indulging in the study of submarine bacteriology, instead of appearing before you to present a short abstract of several of the important papers that were presented to the Tuberculosis Congress.

The reports so far available were published in *La Presse Medicale*, and it is from this that I have gathered a few notes, which appear in this paper.

The paper is a report upon the employment of serum and toxins in the treatment of tuberculosis, by Prof. Landouzy, *La Presse Medicale*, July 30, 1898.

The author reviewed the history of the treatment of tuberculosis by means of toxins, beginning with the work of Hericourt and Richet, reviewing the work done in Germany, France and Italy only, with a brief reference to Hirschfelder's results. The general conclusions to which the author came, were that the serum treatment as applied to tuberculosis by the experimenters that he quoted, had not given results sufficiently appreciable, constant and certain to warrant the conclusion that this was specific treatment, and cannot be compared with the anti-diphtheritic serum. He agrees with the often-expressed opin-

ion that many writers came to, who have worked conscientiously in the study of the serum treatment for tuberculosis, that we expect more than it is possible to obtain when we think that a specific can be found which will not only counteract the poisons of the bacilli, but also destroy the germs and renew destroyed tissue. While the good results so far obtained indicate what may be accomplished, they serve only to show the lines for more advanced and careful investigation.

In another paper, Nocard, the distinguished French veterinarian, reported the results of some experiments which aid in establishing the fact that the germ of human and avian tuberculosis are races or varieties of one and the same species. The majority of exeprimenters, in testing the virulence of the avian germ with reference to mammals, have made subcutaneous inoculations in guinea-pigs and ordinarily the material derived from birds has failed to produce tuberculosis. The rabbit, on the contrary, seems to be equally sensible to the human and avian germ, and after several passages through this animal, the lesions produced are identical, whether the one or the other germ is the source of disease. In order to establish the relationship between these two germs more thoroughly, Nocard made use of an experiment similar to that which has given him such satisfactory results in isolating the germ of pleuro-pneumonia. Cultures of human tuberculosis were made upon glycerine bouillon, placed in hermetically sealed collodion sacks and these sacks were introduced into the peritoneal cavity of a chicken. Changes took place very rapidly between the contents of the sack and the fluid of the body of the chicken, which modified the composition of the nutritive media very materially. The tubercle germs enclosed in the sack lost, little by little, their special characteristics, and when they had remained a sufficient length of time in contact with the organic fluids of the bird, the special properties of the human germ had entirely disappeared. The characteristics of the cultures obtained from the germ in this way are practically identical with those of the avian tubercle germ. Nocard concludes that if the simple passage, sometimes of considerable length, however, is sufficient to produce such modifications, the human and avian tubercle bacillus can only be two varieties of one and the same species. (This agrees with the conclusions that have been arrived at by other workers, that the tubercle germ adapts itself to its surroundings, either inside of the body of various species of animals, or outside of their bodies, upon various culture media. While the germ derived from certain animals may exhibit some differences from those derived from other animals, these differences disappear under other surroundings, and are not sufficient to warrant the assumption that the germs belong to entirely different species.—E. A. de S.)

M. Huon, veterinarian in chief of the abattoir in Marseilles, presented also at this congress a report of what may be considered a very valuable experiment. He kept in an isolated place a cow which had been subjected to test with tuberculin the day upon which it had been received. The animal showed itself healthy in every particular and no signs of tuberculosis were noticeable. The employe who looked after this animal had been quite sick for some time, and his sputum contained an abundance of tubercle bacilli, and he finally died from tuberculosis. Huon then injected the cow again with tuberculin and obtained a characteristic reaction for tuberculosis. The animal was kept for several months and finally killed, and the autopsy showed extensive tubercular lesions in the lungs. There was no doubt whatever but that the animal had contracted tuberculosis from the attendant, who had the habit of expectorating a good deal, especially around the stable.

Another paper, presented by Dr. A. J. Martin, upon the disinfection of places occupied by tuberculous individuals, recommends not only thorough sterilization of the sputum, but also of all articles with which the patient comes in contact.

A paper was presented by Arloing and Nicolas upon the influence of streptococcic infection after inoculation with tuberculosis. They conclude from their experiments that previous infection with streptococci from which rabbits had apparently recovered, was the cause of very much more rapid development of tuberculosis in these animals when the latter germ was given to them.

Another paper was presented by Bouchard and Claude upon the application of the X-rays to the diagnosis of pulmonary tuberculosis. From their results they have concluded: That the use of the X-ray is very important and valuable in the proper diagnosis of pulmonary tuberculosis.

Arloing and Guinard presented a paper upon the study of the physiological effects of different substances contained in the cultures of the tubercle bacillus. Their conclusions were as follows: It is possible to obtain a tuberculin very much stronger than the one ordinarily used. The gastro-intestinal cardiac and vaso-motor poisons are contained principally in the bouillon cultures. The poisons that have a moderate cardiac action and cause increased temperature are contained in the body of the bacilli. The elements which are precipitable by alcohol are absolutely indispensable for the proper reaction of tuberculin.

The congress adopted the following resolutions:

It is absolutely necessary, in order to prevent the spread of contagious diseases, to separate diseased and healthy animals: diseased animals should not be sold; milk cows should be very thoroughly inspected, and those animals immediately killed that are found to have diseased udders; sterilization in whole or in part of the milk that is to be consumed, and pasteurization of milk that is to be used in the production of butter.

THE TREATMENT OF INEBRIATES.

By A. M. ROSEBRUGH, M. D.,

Secretary Prisoners' Aid Association, Toronto, Ontario.

In this paper I desire to call attention to the treatment of pauper inebriates and to suggest an economical scheme for the treatment of the more hopeful class of these unfortunates.

In 1890-91 the writer of this paper had the honor of acting on the Prison Reform Commission appointed by the Ontario Government. One of the duties of this commission was to make inquiry as to the cause of crime in the community, the relation of intemperance to crime and the most approved methods of treating inebriates. In prosecuting this phase of the investigation, sheriffs and prison and jail officials were examined under oath, as well as a number of Canadian and American gentlemen who were in a position to give an opinion as experts. Medical superintendents of lunatic asylums and jail surgeons gave evidence also. All agreed that intemperance is a most prolific cause of crime. A number placed intemperance second to that of parental neglect as a cause of crime. A number testified also that, in their judgment, intemperance, directly and indirectly, is the chief cause of crime. A number testified also that, at least in the case of chronic alcoholism, inebriety is a disease and should be treated accordingly. With regard to the general custom of treating inebriates as criminals by sending them to jail, all agreed that this treatment is neither deterrent nor reformatory, that it is unphilosophical and bad economy, and by a number it was characterized as being inhuman.

After a most careful consideration of all the evidence, and after submitting the proposition to a number of gentlemen qualified to give an opinion, and by whom the proposition was endorsed, the commissioners made the following recommendation with regard to the treatment of inebriates in Ontario:

"The commissioners recommend that the government, out of the funds derived from the fees for Provincial licenses (which might be temporarily increased for that purpose) shall erect in the centers of population one or more industrial reformatories for inebriates. Every such reformatory should be near a city, and should have attached to it a sufficient area of good land for the employment of the inmates in farming and market gardening; it should also be furnished with means for employing the inmates in suitable industrial occupations.

"That to this reformatory be committed all habitual drunkards, that is to say, all who have been previously convicted of drunkenness three times within two years; such other persons addicted to the use of strong drink as in the opinion of the county judge may be reclaimed by timely restraint and judicious treatment; and those who may be compulsorily committed to an inebriate asylum under the provisions of the Inebriate Asylum Act. The first committal to this reformatory should be for a period not shorter than six months; the second for not less than one year, and the third for two years, less one day. That any inmate whose term of imprisonment exceeds six months may, after he has been detained for six months or more, be permitted to return home on parole if he has given satisfactory evidence of a sincere desire to live soberly and of strength of mind sufficient to enable him to keep his good resolution—such license to be granted on the recommendation of the superintendent, endorsed by the inspector of prisons and approved by the Provincial Secretary; such license to be revoked if the conditions on which it is granted be not observed.

"That if the families of any inmates of a reformatory for inebriates be wholly dependent on them for support, a portion of the proceeds of the earnings of such inmates be paid to their families; also that a portion of the net earnings of the inmates, after defraying cost of maintenance, shall be set aside to form a fund, out of which those whose general conduct has been good and who give evidence of being reformed, shall be assisted in their efforts to earn a living for a time after leaving the reformatory.

"That after a third commitment to an industrial reformatory for inebriates, a drunkard be again convicted of drunkenness he shall then be sentenced to the Central Prison for the full period authorized by law."

These recommendations have been endorsed by the Ontario Medical Association and by a number of other influential public bodies, but the Ontario government has persistently declined to give them practical effect. The Ontario government declines to take action on the following grounds: Firstly, the number of inebriates in the province is very large and the expense for buildings and maintenance would be very great; secondly, it would be impossible to provide such a large body of men with industrial employment, and thirdly, the temperance organizations are taking very little interest in the movement. On grounds of public policy, as well as on economic grounds, we believe the government is making a mistake. If only thirty-three and one-third per cent. of drunkards are reformed by reformatory treatment, and this is estimated by competent authorities as the min-

imum number, the expenditure would be more than justified. This attitude having been assumed, the question arose, firstly, should this attitude on the part of the government be accepted as a finality, and secondly, cannot a less expensive scheme be devised, which, although falling short of accomplishing all that could be expected of an industrial reformatory, might, nevertheless, be the means of rescuing a large number from drunkenness and a drunkard's grave?

Under these circumstances the Prisoners' Aid Association of Canada, in January last, asked me to visit inebriate hospitals, to interview specialists, and to formulate, as far as possible, a practical and economical scheme for the consideration of the government for the scientific treatment of pauper inebriates. As a preparation for executing this commission, I visited eight institutions devoted to the treatment of inebriety and interviewed a number of specialists, including the following, namely, Dr. Lett, of Guelph; Dr. Crothers, of Hartford; Dr. L. D. Mason, of Brooklyn; Dr. Hutchison, of Foxboro, and Dr. Elsworth, of Boston. I investigated the Boston probation system, as applied to the case of drunkards, and I made careful inquiry into the comparative merits of the different systems of treatment, whether in accord or out of accord with the generally accepted tenets of legitimate medicine.

In formulating this scheme I had in view, necessarily, the requirements of the Province of Ontario, but if the plan herein outlined for Ontario be a good one, there is no reason why it should not be adapted to the other provinces as well.

It is, in brief, as follows:

1. The appointment by the Provincial Government of an inspector of inebriate institutions. This inspector should be a qualified medical practitioner who has made the medical treatment of inebriety a special study.

2. The inspector should organize in the city of Toronto a hospital for the medical treatment of pauper male inebriates of the more hopeful class, and in other cities of the Province either a separate hospital or an inebriate department in the existing general hospitals, more especially for pauper male inebriates.

3. An industrial reformatory should be established on the farm colony plan for the custody of the more hopeless or incorrigible class of male drunkards, and where they should be detained on indeterminate sentences.

4. In the adoption of scientific medical treatment the Norman Kerr-Crothers system or general plan of treatment is recommended. In the interests of science and good morals, proprietary remedies should not be used.

5. The adoption of the "probation system" and giving a helping hand to patients subsequent to treatment for inebriety.

6. In the case of habitual female drunkards my recommendation is that they be sent to the Provincial reformatory for the full term of two years and that this be repeated in case of relapse. In case of the more hopeful class of female drunkards I recommend a few weeks' special treatment in any of the existing homes or refuges for females, followed up by subsequent judicious supervision. Arrangements to this end should be made by the Government Inspector, who should also inaugurate and have supervision of the "probation system."

In Ontario there is a per capita Government grant of 30 cents a day to all hospital patients. In order to secure the co-operation of hospital trustees in the proposed plan it may be necessary to ask the Government to increase this grant to say 35 or 40 cents a day for inebriate patients. The hospital accommodation, in some cases, may be too limited to admit of the reception of these cases. In that case, possibly the Provincial Government may be disposed to come to the aid of the trustees.

An essential feature of this scheme is the proposed utilization of the Massachusetts probation system in giving a helping hand to reformed inebriates subsequent to the hospital treatment. By giving the inebriate a helping hand, and more particularly by finding him employment, he is rendered a service quite as important as that of giving him special medical treatment. Both are essential. The man will not seek employment or retain it when obtained for him so long as he has a craving for intoxicants, and on the other hand a reformed inebriate will not long remain reformed if he fail to secure remunerative employment.

In every city and large town in Ontario there is either a truancy officer or an agent of the Children's Aid Society, or both. What I would suggest is that the services of one of these officers be secured to act as probation officer. I have no doubt, in most cases, this will not be difficult.

It is to be understood, of course, that this scheme is not suggested as a substitute for, or to take the place of, a Government reformatory or farm colony for inebriates. That will still be necessary, and it would be complemental to the proposed hospital and probation system. The latter is suggested for the treatment of the more hopeful cases while the former will be required for the prolonged detention of the less hopeful and incorrigible class.

Among the advantages that may be claimed for the hospital and probation system, are, firstly, it may be inaugurated at any time with-

out waiting for the erection of expensive buildings, and, secondly, in my judgment, maximum efficiency would be secured with minimum expense.

While advocating the utilization of existing hospitals in the treatment of inebriates, I am free to admit that in the larger cities much better results might be expected from the establishment of a special hospital.

My recommendations have not, as yet, been formally presented to the Ontario Government and I am not in a position to state what action may be taken with respect thereto. The attention of the Inspector of Hospitals, Prisons, etc., has been called to the question and I infer from what has passed between us that he is disposed to look upon the proposals most favorably, and I may add that at his suggestion, I am now about to correspond with hospital trustees to ascertain to what extent their co-operation can be counted upon.

As the carrying out of the proposed hospital treatment will naturally devolve upon the house surgeons, many of whom are recent graduates with limited experience, my proposition is that the special medical treatment of inebriate patients shall be under the direction and supervision of the Government inspector to whom a detailed history of each case, with all relevant facts, shall be promptly forwarded on admission. This does not refer to the preliminary treatment, which, in most chronic cases, might be entrusted to the house surgeons. By placing the special treatment under the control of a central authority, there will be unity of purpose, statistics can be collected, results compared and tabulated and progress made.

As already stated, if this scheme promises to result in the successful treatment of inebriates in Ontario, it should be equally successful in each of the other Provinces of the Dominion.

I may add that Dr. Stephen Lett of the "Homewood Retreat," Guelph, Ont., speaks of this scheme as follows:

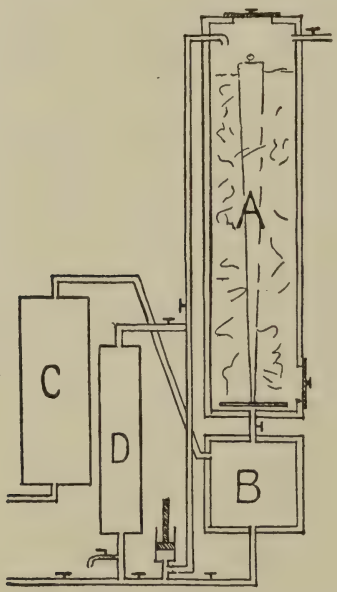
"The general plan outlined is a good one and has my hearty indorsation; if care is exercised in carrying out the details, I am confident much good will result. Your fifth clause providing for probation and a helping hand subsequent to treatment is most valuable."

Dr. T. D. Crothers, of Hartford, Conn., says: "I agree most heartily with your plan. I cannot come to Ottawa, having important business here at that time."

GARBAGE REDUCTION BY STEAM.

By Dr. M. A. VEEDER, Lyons, New York, and Mr. J. L. RICHARDS, Sanitary Engineer, Elizabeth, New Jersey.

The accompanying diagram represents an apparatus for the reduction of garbage by steam that is essentially new, and with reference to which a caveat has been filed at Washington. *A* and *B* are double jacketed cylinders placed the one above the other, and kept hot by steam between the jackets, and their interiors are connected by a pipe leading from the bottom of the upper cylinder to the top of the lower cylinder. *C* is a vacuum and condensing chamber from which a pipe leads to the upper part of the lower of the two jacketed cylinders. There is also an outlet from the bottom of this lower



cylinder leading to a pump placed low enough to work by gravitation of the fluids carried to it, if necessary, so that its action is sure and easy in all conditions of vacuum that may be established in the cylinders. This pump is connected by a system of pipes having valves so placed that it may take fluids from chamber *B* and force them into the top of chamber *A*, or by changing the positions of the valves, into another tall narrow chamber marked *D*. This chamber *D* has an outlet at its bottom so controlled by valves that its contents may be

carried to the pump in the one direction and so again placed in the top of chamber *A*, or carried in the other direction, its contents find an outlet through which they leave the apparatus here shown entirely. The inlet for live steam is near the top of cylinder *A*. A removable conical shaped tube having perforations on its sides may be placed vertically in the centre of chamber *A* to facilitate the diffusion of the live steam when this chamber is filled with garbage. The smaller end of this tube being downward it may be lifted by a chain attached, loosening the garbage and facilitating its removal at the close of the process.

The mode of working is as follows: The garbage, just as it comes from the houses without preliminary sorting or handling, is placed in the upper jacketed cylinder, through the door at its top, which is then closed so as to be steam tight. Steam is then admitted between the jackets of cylinders *A* and *B*. Next a vacuum is produced in the interior of these cylinders, and in cylinder *D* also, through their connection with the vacuum and condensing chamber *C*. This step of the process is facilitated by opening all valves except that leading from chamber *D* to the open air, and that admitting live steam. As soon as the vacuum is obtained, the valves connecting chamber *D* with the rest of the apparatus are closed so as to compel the steam when admitted to the top of chamber *A* to traverse the garbage. The steam thus admitted at once penetrates the most minute interstices of the entire mass, the air which would hinder such rapid and complete diffusion of the steam having been previously withdrawn. The temperature also is raised in the interior of the garbage to the same degree as on the surface. Thus the watery portions of the garbage are vaporized, and the greases liquified. The pressure of the steam and force of gravitation assisting each other carry these fluids rapidly downward into chamber *B*. This chamber being kept hot by its steam jacket the vapors entering it are prevented from condensing and pass on into the vacuum and condensing chamber where they are finally reduced to liquid form and pass off in a very nearly colorless and odorless condition, they consisting almost entirely of distilled water. The residual fluids in chamber *B*, incapable as yet of distillation, find an outlet downward into the pump by which they may be conveyed to the top of cylinder *A*, or to cylinder *B*, as found advisable. In the former case these fluids fall upon the garbage in cylinder *A*, which is being rapidly dried and baked and compressed by the superheated steam, and finally almost carbonized, if the process be continued long enough. In this condition the garbage constitutes a filter adequate to cleanse the residual fluids, certainly of all matter held in suspension, and perhaps near the end of the process even

make them colorless, or nearly so. These fluids re-exposed to fresh steam and minutely subdivided in the garbage are more completely vaporized. Thus if at the outset the garbage were so wet that vaporization of its watery portions should be incomplete, and the residual fluids in chamber *B* should be very large for this reason, returning them to the top of chamber *A* would bring about their rapid evaporation and reduction of volume, the watery portions passing continually into the condensing chamber with the superheated steam. On the other hand at any stage of the process the residual fluids in chamber *B* may be diverted into the tall narrow cylinder *D*. In a receptacle of this form the greases readily separate from the other fluids and form a layer at the top. They may be removed by first shutting the valve near the bottom of chamber *B*, and then opening that between the pump and chamber *D* very slightly so as to draw down the contents of this chamber very gradually. The small tap just below the cylinder being open just enough to allow leakage drop by drop into a small glass jar, it may be known when the layer of greases has come down to that level, and the valve which has been permitting the pump to put the fluids drawn off from *D* back into cylinder *A*, may be closed, and the valve leading, in an opposite direction to the open air may be opened. If live steam be then admitted to the top of cylinder *D* the pressure exerted on the escaping greases will force them through any system of pipes or to any receptacle desired. Experience will soon determine the point at which the greases are best removed, it being possible by the arrangement which has been described to obtain a specimen at any moment.

Thus the process yields distilled water, clean greases, and a dry residue containing not only the solids obtained directly from the garbage, but also everything filtered out from its watery portions. There is no handling over of material, or cooling and reheating, the process being in every way economical as well as cleanly. Only faint sweetish odors are given off, not more objectionable than those from a malt house or brewery and not so abundant. The sorting and grinding the material subsequent to reduction is likewise a cleanly process. The chief point to be guarded is to have the garbage collected and worked up when as fresh as possible so as to avoid the smells that would arise from fermentation before the beginning of the process. The effluent being distilled deposits no sediment to accumulate and rot, and may be thrown into any stream or into a sewer with impunity. Hence it is not difficult to secure eligible locations for such a plant.

Minor points that may be noted are as follows: At the bottom of cylinder *A* there is a movable plate of metal having a smooth upper

surface so placed as to facilitate shovelling the garbage through the door of exit. This plate having a space underneath and between its margin and the sides of a cylinder is so adjusted as to permit vapors and fluids to pass downward, but not dirt. It is movable so that it can be lifted and the space underneath cleaned whenever necessary. In case that the fluids passing into chamber are very foul they can be thoroughly agitated and prevented from depositing a sediment by admitting live steam to the bottom of this chamber by opening the valves above chamber *D* leading to the top of chamber *A*. Also the valves may be so placed as to make a direct outlet to the open air from the bottom of chamber *B* and steam or water passed through for the purpose of cleansing. Other points in regard to the care and management of the apparatus will readily suggest themselves. The process certainly obtains whatever there is of value in the garbage, whether much or little, in the most economical and sanitary way, the rapid circulation of the steam downward making the process extremely expeditious as compared with cremation and other methods.

REPORT OF THE COMMITTEE ON PUBLIC HEALTH LEGISLATION.

By U. O. B. WINGATE, M. D., Milwaukee, Wis.

I had hoped Dr. Walcott would be here to make the report of this committee, but as he is not present, I will simply make a brief report of progress.

Since the last meeting of the Association, held in Philadelphia, and after action was taken defining a certain course of procedure, as you are all aware, a bill was drafted and introduced into Congress. The bill was introduced into the Senate by Senator Spooner, of Wisconsin, and into the House by Theo. Otjen, M. C., also from Wisconsin. A great deal of work has been done during the past year to create public sentiment in favor of this measure, and I think with satisfactory results. It was understood from the start to be very slow work, but we have succeeded in getting a considerable amount of public sentiment in favor of this measure. I think it is safe to state that the Spooner bill is receiving more support at the present time than any other measure of the kind that has ever been introduced into Congress. It has received the endorsement of the American Medical Association at a full meeting, recently held at Denver; it has also received the endorsement of the New York Academy of Medicine and of various medical organizations throughout the country, which have passed resolutions in regard to it. Furthermore, it has received the endorsement of the New York Board of Trade and Transportation, which is a powerful organization, exerting much influence all over the country; and I wish to state that this Board has done much valuable work in supporting this measure. It has also been supported practically by all boards of health, a large number of sanitarians and physicians throughout the country. Of course, it has its enemies. But at the time of the war with Spain the matter was already in the Senate to go before Congress, and I have no doubt that had it been considered by the Senate at that time it would have passed that body, although the Senate committee refused our committee a hearing, having decided in favor of the Caffery bill, which increases the powers of the Marine Hospital Service, so far as quarantine is concerned. There was so much pressure brought to bear, however, upon the members of the Senate that I have no doubt the bill would have passed that body had it come up at that time. The House com-

mittee gave us a hearing, and before that committee Dr. Doty, of New York; Dr. Horlbeck, of Charleston, and your speaker appeared and made as strong an argument as we could. That committee did not report, however, back to the House any measure before Congress adjourned, but it was well understood that the House was watching closely what action the Senate might take, and would undoubtedly follow its course. As the war put an end to all such matters, the bill remains in the hands of Congress, and at the next session the matter will be taken up again, and we hope influence will be brought to bear to pass this measure during the coming session. Much work needs to be done with the members of Congress from each state in influencing them. It also is absolutely necessary for some one to be in Washington to watch the bill in order to get it through Congress. It is an immense amount of work to get a bill through Congress. It must be watched step by step, and some one posted in regard to it should be there, otherwise the bill is liable to be side-tracked at any time.

I argued this matter before the New York Board of Trade and Transportation, and was successful in getting their co-operation. I also went to Mobile, Alabama, to the Sanitary Congress that was held there, and argued the matter, and went to Washington five times and did what I could to further the interests of the measure. We hope at the next session of Congress to accomplish something.

ANTHRAX.—THE EFFECT OF TANNERIES IN SPREADING THE DISEASE.

By MAZŸCK P. RAVENEL, M. D.,
Bacteriologist to the State Livestock Sanitary Board of Pennsylvania.

READ BY TITLE.

My attention was called to this subject by the outbreak of anthrax in men and cattle at three different points in the State of Pennsylvania during the summer and fall of 1897. From reports which I have not been able to entirely verify, it is likely that as many as twelve men and sixty head of cattle died of anthrax near the tanneries in this State during the year.

The men were without exception operatives at the tanneries, while the cattle were on pastures watered by the streams carrying off the refuse of these tanneries.

The importance of the subject led us to make as thorough an investigation of these outbreaks as was possible under the circumstances. At the instance of Dr. Leonard Pearson, State Veterinarian of Pennsylvania, on December 9, 1897, I visited the tannery at Proctor, Penna., where the last outbreak occurred. I found the operatives considerably excited, and standing in groups about the street, as a result of three cases of anthrax, two of which resulted fatally within a short period of time, and one of which was then under treatment, and fortunately terminated in the recovery of the patient. From one of the physicians in attendance on this case I learned that four men had died in the vicinity besides the two just mentioned, from an acute affection which was diagnosed at the time as pneumonia, but which he considered, in the light of subsequent events, to have been cases of pulmonary anthrax. I made bacteriological examinations from the blood and eschar which marked the initial lesion in the men then sick and isolated the anthrax bacillus, which proved to be of quite a virulent type when inoculated into guinea pigs. From the liver and spleen of a cow which had died at one of the other two tanneries at which outbreaks occurred, I also succeeded in isolating virulent anthrax bacilli. The superintendent of the third tannery, which I did not visit, told me that twenty-four cases of "malignant pustule" had developed among the operatives recently, three of the cases proving fatal. No bacteriological examination was made in any of these cases and the diagnosis was made entirely from the symptoms. Below this tannery at least twelve head of cattle had died in a short time before my visit to the neighborhood, deaths occurring as

much as ten miles down the stream. From one of these animals I obtained specimens some time after death, and though I failed to isolate the anthrax bacillus, the symptoms were such as to leave little doubt that anthrax was the cause of death in most if not in all of the cattle which had died. In tracing the history of these cases at these three tanneries and in looking for the cause of the outbreak, I gained the information that they were all operated under the United States Leather Company, and that each of them had received a part of a cargo of hides shipped from China. Among the operatives, these Chinese hides go under the technical name of "murrain" hides and are believed by them to come from cattle which have died of disease; but the superintendent of the Proctor tannery did not agree in this opinion, believing some of them to have been from animals slaughtered for beef, and that some had been taken from animals dead of disease. There seems to be no positive way of telling the difference between the two.

This brief outline shows the danger to which every State engaged in the tanning business is at all times liable. It cannot be doubted that from all the countries which ship raw hides to the United States there may come at times the hides of cattle which have died of anthrax. There is a law in the United States providing against the importation of hides from districts where anthrax is known to exist, but the difficulty of enforcing it lies in the fact that the hides often do not come directly from such districts, and also that the reports from some such countries are exceedingly meagre, and it is impossible from them to be sure of the good health of the cattle there. We also occasionally hear of cases of anthrax among workers in leather, and one case has occurred in the city of Philadelphia in a brush maker, employed in making coarse scrubbing brushes, in the manufacture of which a mixture of hogs' bristles and horse-tail hairs were used, the hair being all imported from Siberia and the southern part of Russia, both sections of Europe in which anthrax occurs quite frequently. One instance has come under my observation in which a horse died of anthrax, the infection seeming to come either from the leather of which the collar was made or else from the hair with which it was stuffed, although I was not able to prove this mode of infection positively. The horse was one of a number in a stable all doing similar work, and all had been together for quite a period of time, none of the others having had the disease, either previously or after.

In studying the cases which occurred in men at the tanneries in this State I was struck with the fact, that as far as I could obtain positive histories, all of these cases occurred in those handling the hides in a dry state and in no case could I trace the history of an infection

taking place after the immersion of the hides into the tanning fluids. While there are some reasons for this, such as the inability of a soft and flexible hide to produce a wound in the skin, which is easily done by the ragged edge of a stiff, dry hide, it occurred to me that the tanning fluid might have such an action on the anthrax germs as to prevent danger from them after exposure to these fluids. This has led me to make a study with the object of determining what, if any, disinfecting action the process of tanning has on anthrax germs.

Briefly outlined, the process of tanning as carried out in the tanneries of the State of Pennsylvania, which I presume is that in common use elsewhere also, is as follows:

The hides are soaked in clean water for about ten days, then milled, and sweated for four days in order to loosen the hair, after which they are milled again and put on the beams for scraping. They next go into the tanning liquors, which are seven in number. The hide is put into a solution made of three parts of water to one part of liquor No. 1. This liquor is changed quite frequently, so that at the end of five or six days it is of the strength of liquor No. 2, in which it is left from six to ten days; it is then transferred to No. 3 for about twelve days; No. 4 for sixteen days; No. 5 from eighteen to twenty days, and No. 6 and No. 7 for about twenty days, the whole process occupying usually about one hundred and twenty days. No chemicals whatever are used in the process, except the solution of bark.

Through the kindness of Mr. J. H. Ball, superintendent of the tannery at Proctor, Penna., I obtained a supply of each of these seven tanning fluids. I have with them carried out two separate experiments, both having as an object the determination of the effect of these fluids on the spores of anthrax. I have used silk threads impregnated with the spore culture of the germ and dried. These threads are easily penetrated and contained nothing which would protect the spores from the action of the fluids as is the case with hides, which contain a large amount of albuminous material, which, as is well known, combines with tannin to form a protective covering for bacteria, so that we may consider that the spores on silk threads should be more easily killed than spores contained in hides, or in dried blood which may be adherent to hides. The culture of anthrax used was obtained from the organs of a cow which had died of anthrax in the neighborhood of one of the infected tanneries.

In experiment No. 1 the spore threads were treated as outlined in the process for tanning, beginning with the solution of fluid No. 1 and gradually increasing in strength until No. 7 was used. In experiment No. 2 the threads were at once immersed into the strongest tanning fluid, No. 7. This was changed every week for the first

month and subsequently changed once a month. The fluids were always used in abundance, 100 cc. being the amount in which the threads were immersed. One thread from each of these was at first taken out each week, inoculated into bouillon, and the culture thus obtained inoculated into guinea pigs. After the first month this was only done once a month. The threads have now been immersed for a period of one hundred and eighty days. The growths obtained at this date are perhaps a trifle less abundant than those obtained at the early stages of the experiment and the virulence of the germ has been possibly lessened in a very slight degree, the last guinea pigs inoculated living for about thirty-six hours, whereas in former inoculations death occurred in from twenty-four to twenty-six hours. However, I unfortunately neglected to weigh the animals used accurately, and the attenuation of virulence is so slight as to have very little practical value. From these experiments we may conclude that the process of tanning, as ordinarily carried out, does not in any way protect the operatives from infection by the anthrax germ, so far, at least, as regards its effect on the viability and virulence of the anthrax germ, though it is possible that the combination of the tannin with the albumen in the hide may, as it were, "fix" the germs so that they are less liable to become detached from the hide.

These experiments, together with the cases mentioned, illustrate the necessity of some method of properly disinfecting hides brought from foreign countries before allowing them to be sent to our tanneries, and this disinfection should preferably be done at the port of shipment. Unfortunately no method has yet been devised for the disinfection of hides which does not injure them for subsequent use, though attempts have been made by the Federal Government to plan and enforce some such method. In this connection much is to be hoped for from some one of the several methods recently devised for tanning by the use of formalin, which is unquestionably one of our most powerful germicides.

In some experiments by the writer a few years since it was found that anthrax spores on silk threads were killed by a momentary immersion into formalin, and it is hard to see how they could escape destruction during a prolonged immersion of a hide in a solution of this substance. Any method of disinfection should be capable of destroying the most resistant spores. It is stated by some authorities that anthrax spores from different sources have varying degrees of resistance to destructive agents, which may be regarded as a race peculiarity. Thus von Esmarch found that anthrax spores, according to their origin, required a five per cent. solution of carbolic acid for at least two days, and in some cases even as long as forty days, for their

destruction. Some anthrax spores will resist a one per cent. aqueous solution of corrosive sublimate as much as three days, though their virulence is destroyed in twenty hours. They will occasionally live in water or steam at 100 degrees C. for as much as twelve minutes, and not infrequently as long as five minutes. A dry heat of 140 degrees C. for at least one hour is required for their certain destruction. It is probable also that the resistance of different spore cultures depends somewhat on the culture media on which these cultures are grown, on the temperature at which the formation of the spores takes place and on their age. Frankland has shown that spores formed at 20 degrees C. are more resistant to the action of light than those formed at the incubator temperature. Dry spores seem to be particularly indestructible under ordinary circumstances, and may keep for years without any deterioration of their virulence or power of growth. It is certain also that the hide of an animal dying of anthrax will contain the spores of the germ and not simply the vegetative form, which is comparatively easily killed, for it must be remembered that the flaying of the animal gives free access of the oxygen of the air to the germs contained in the capillaries of the skin and subcutaneous cellular tissues, the one condition so necessary to the formation of the spores. Animals usually die of anthrax during warm seasons, so that the temperature necessary for the formation of spores is also usually to be had under these circumstances.

The important points for the protection of our cattle industry and of the operatives in tanneries are, then, as follows:

First: The discovery of an economical and simple method of thoroughly disinfecting hides without injury.

Second: A more reliable method of obtaining reports from countries which export hides.

Third: A process of tanning which will in itself destroy the germs of anthrax.

OFFICIAL REPORT OF THE PROCEEDINGS OF THE TWENTY-SIXTH ANNUAL MEETING OF THE AMERICAN PUBLIC HEALTH ASSOCIATION.

Held at Ottawa, Canada, September 27, 28, 29 and 30, 1898.

FIRST DAY—MORNING SESSION.

The Association met in the Railway Committee Room of the Parliament Building, at 10 A. M., and was called to order by the President, Dr. Charles A. Lindsley, of New Haven, Conn.

President Lindsley introduced Dr. John Sweetland, of Ottawa, chairman of the local committee of arrangements.

Dr. Sweetland spoke as follows:

Mr. President and Members of the American Public Health Association—As chairman of the local committee of arrangements, I must say that we have all been pleased to do something to further the interests of this Association in arranging for the business of the meeting. We hope to do something which will leave a pleasant impression when you leave Ottawa and Canada, and to show you that we are not entirely inhospitable, although we may live in the Far North, where we have the reputation of being frozen up six months in the year. We have a program, to be placed in your hands this morning, setting forth very fully what you are expected to do during the week. I think it might be well to draw your attention to one or two points in connection with it.

At 10 A. M. Tuesday, the Association will meet in the Railway Committee Room of the Parliament Building. All the meetings of the Association are open to the public. After preliminary business the executive committee will probably cause the papers on "Refuse Disposal" to be read and discussed. Adjournment will take place about 1 P. M., and in the afternoon the Association will reassemble at 3 o'clock.

The formal opening of the Association will take place in the City Hall at 8 P. M., sharp, when the chairman of the local committee of arrangements will preside. The Rev. William Moore, D. D., will open the session with prayer. The members will be welcomed by the Hon. Sydney Fisher, Minister of Agriculture; Sir James Grant, K. C. M. G.; His Worship Mayor Bingham and Alderman Black.

The First Vice President, Dr. Benjamin Lee, will then take the chair and introduce Dr. Charles A. Lindsley, President of the Association, who will deliver the annual address.

Wednesday the Association will meet at 10 A. M., in the Railway Committee Room.

At 1 P. M. special electric cars will leave the postoffice, carrying the members and their ladies to Hull, Aylmer and Victoria Park. At 2 P. M. the steamer "G. B. Greene" will leave the Park Wharf for the Chats Rapids, returning at 6:30 P. M., in time for dinner at the Victoria Hotel. If the weather is not favorable, the excursion may be abandoned, in which case the special cars will leave at 5 P. M. from the postoffice for the Victoria Hotel. No separate invitation cards have been issued for the excursion, but it is understood that all members of the Association, with the ladies accompanying them, are invited both to it and the dinner.

Thursday the Association will meet at 10 A. M. in the Railway Committee Room, and also in the afternoon at 3 o'clock.

In the evening at 8 o'clock, the ladies' committee will hold a reception in the drawing room of the Russell House.

The Association will meet Friday at 10 A. M. in the Railway Committee Room.

The members of the Association and ladies accompanying them are invited by the Hon. Sydney Fisher, Minister of Agriculture, to an afternoon tea at the Central Experimental Farm, on Friday afternoon. At 2 P. M. special electric cars will leave the postoffice for the Queen's Park, from whence the guests will be conveyed to the farm.

The Secretary presented the minutes of the last meeting as printed in the transactions.

On motion of Dr. Rohé, the minutes as printed were approved.

The President.—We will now listen to the report of the executive committee.

The Secretary.—At the last meeting of the Association resolutions were handed in by Mr. Lomb and referred to the executive committee. The executive committee recommends the adoption of thse resolutions, amended as follows:

Whereas, Resolutions have been presented for the consideration of this Association by our esteemed life member, Mr. Henry Lomb, setting forth the desirability of sustaining all existing voluntary sanitary organizations, and outlining a plan for the multiplication and extension of these most useful adjuncts to official sanitary operations; and

WHEREAS, We believe, after a careful examination of the questions relating to voluntary service for the promotion of the public health, that one of the most promising directions in which energetic efforts can at present be exerted will be to devise and establish on a permanent basis a system for the instruction and training of persons who are already pursuing, or may desire to engage in the business or calling of sanitary inspection; therefore, be it

Resolved, That while we recognize the value of the local auxiliary sanitary societies, which are, in many of the states, doing much to popularize the science of hygiene, yet we are of the opinion that the effectual enforcement of the laws and ordinances designed to prevent the spread of disease, can, at this time, best be assisted by supplying for employment by executive health officers, men who have been taught the art of hygiene.

Resolved, That the American Public Health Association hereby signifies its approval of any proposition having for its object the establishment of a separate institution, or a department in connection with any reputable institution of learning already established, to be devoted to the instruction and training of sanitary inspectors.

THE PRESIDENT.—You have heard the resolutions and the recommendation of the executive committee. What disposition will you make of them?

DR. SAMUEL H. DURGIN, of Boston.—I move that the resolutions be adopted.

DR. BENJAMIN LEE, of Philadelphia.—In seconding the motion, I desire to say the recommendation that institutions of learning already existing, having the power to give instruction in hygiene should be encouraged by every possible means to do so, and that institutions of learning which do not at present possess this power, should work, through their respective Legislatures, with a view to obtaining it. At the present time we are making this effort in our own state, and will take up this question and agitate it. We hope to be able at no distant time to obtain a higher class of health officers and inspectors than those we find in most of our states. I believe, so far as I am able to judge, that in Canada the ratio of men who are competent to undertake such positions is greater than it is in the United States. In many of our states and cities men are filling such positions who are absolutely without the slightest qualification of any kind, and it has occurred because facilities have not been furnished for the education of men in this special branch; and then, too, because the public do not insist upon having them properly educated. I feel that this special feature in the resolutions is one of great importance.

DR. HENRY MITCHELL, of Asbury Park, N. J.—I think we from the United States are willing to pay a tribute to England for leading

in this matter. We recognize the fact that for a long time, for perhaps twenty years, a system has been in operation for the training of men for the sanitary inspection service in that country, although I understand that not even yet is the requirement made that the local authorities shall employ men who possess a certificate from the sanitary institute; at the same time (and I do not profess to be well informed), it is the custom, to a great extent, to select men who hold these certificates. In our country, as Dr. Lee has said, the selection of these men is by necessity from all classes of clerks, and other people who seek a small salary, and entirely without reference to their ability to perform the services required of them.

In New Jersey the first step has been made toward the traning of sanitary inspectors. In New Brunswick, N. J., Rutger's College grants certificates of competency, certifying to the knowledge of applicant in relation to matters upon which he should be informed, and which relate to his duties as inspector. I believe the remarks of Dr. Lee are timely, and that this Association should use its best endeavors to encourage and bring to the notice of the public any effort of this nature on the part of the institutions of learning.

The next step, and another one that has not yet been taken, is the preparation of the executive officers, the instruction and selection of executive officers for sanitary work. Those who are now engaged in this work are largely physicians; they have a grounding, but of course there are many departments in sanitary administration that are not taught in medical schools, and the men who undertake this work must learn these details by themselves.

It seems to me that the next step should be to supply the sort of instruction that these men need.

The report of the executive committee was concurred in and the resolutions adopted.

The Secretary.—The executive committee wishes to bring before the Association the question of changing the present form of publication of the proceedings. So many complaints have come to the executive committee in regard to the quarterly journal that, after careful consideration, the executive committee begs leave to report to the Association its recommendation to return to the old style of publishing an annual volume of transactions.

Dr. Horlbeck.—I move its adoption. Seconded and carried.

The Secretary.—At the last meeting of the Association, resolutions were handed in by the committee on vital statistics, which were referred back to the executive committee to be reported upon this year. The executive committee recommends their adoption, with

certain omissions and changes, which have been requested by the committee itself, provided that the cost to the Association of carrying out the purport of these resolutions shall not exceed $75. The resolutions are as follows:

Resolved, That the American Public Health Association earnestly recommends that a plan be incorporated in the act to provide for the taking of the next United States census whereby reliable representative vital statistics may be secured for the non-registration states.

Resolved, That the American Public Health Association recommends that the Bertillon classification of causes of death be adopted by all the registrars of vital statistics in the United States, Canada and Mexico, as soon as the change from the systems now in use can be conveniently made.

Resolved, That the Committee on Nomenclature of Diseases and Forms of Statistics be authorized to have printed and circulated among the registrars of the three countries, a circular containing these resolutions, the report of the committee on which it is based, the three alternative forms of the Bertillon classification, with explanatory notes on inclusion of terms and practical rules for compilation, and a list of the registration offices adopting the same.

Resolved, That a proposal be made for an international alliance between the registrars of the three countries included in this Association, and the registrars of France and other countries now using, or which shall hereafter adopt, the Bertillon system, and that definite plans for such alliance shall be submitted for action to the next annual meeting of this Association.

THE PRESIDENT.—The resolutions are before you.

DR. DURGIN.—I move their adoption. Seconded by Dr. Gihon.

DR. WILBUR.—The concluding resolution calls for the submission of a definite plan of revision, and if that plan is not adopted at this meeting, it will be too late to go on with the work of vital statistics. I therefore wish to submit a plan of revision, and a report on the same, by the statistical authorities of France, and to offer some resolutions for the purpose of putting it into effect.

THE PRESIDENT. It would seem to the Chair that this matter should be taken up at the time the committee makes its report to the Association.

DR. WILBUR.—I wish to present it now in order that it may go before the Executive Committee, so that the Executive Committee may be prepared to report upon the plan after the reading of the regular report. (Resolutions adopted, and the plan of revision referred to the Executive Committee.)

THE SECRETARY.—At the last meeting of the Association a proposed change to our Constitution was offered by Mr. Lomb, as follows:

Resolved, That for the year 1898-9 the annual membership fee for members of the Association shall be $3.00; or if at the next annual meeting the condition of the treasury will permit, it shall be $2.00.

Resolved, That the Executive Committee shall, at any time during the year, by a two-thirds vote, be authorized to select new members.

This amendment to the Constitution was laid over, and now comes before the Association.

DR. GIHON.—I move that it be laid on the table. Carried.

The scientific programme of the Association was now taken up. Dr. R. M. Bucke, of London, Ontario, contributed a paper entitled "A Short History of Sewage Disposal." In the absence of the author, the paper was read by Dr. Bryce. (See p. 27.)

Mr. Thomas MacFarlane, of Ottawa, followed with a paper entitled "Remarks on the Disposal of Refuse in Some European Cities." (See p. 31.)

Mr. C. G. Horetzky, of Ottawa, read a paper on "The Most Recent Methods of Sewage Disposal, and Their Application to Certain Cities in Ontario." (See p. 51.)

Captain W. F. Van Buskirk, of Stratford, Ontario, read a paper on "The Filtration of Sewage." (See p. 60.)

DISCUSSIONS ON THE PAPERS OF DR. BUCKE, MR. MACFARLANE, MR. HORETZKY, AND MR. VAN BUSKIRK.

DR. J. N. HURTY, of Indianapolis, Ind.—I rise to ask Mr. MacFarlane a question as to where this moss litter may be obtained, and in how large quantities?

MR. MACFARLANE.—We in Canada have large quantities of moss and moorlands, particularly in certain sections of our country, and it will be found that this moss litter constitutes the upper layer. It is not really peat. It is simply a mass of vegetation that has ceased to live, on the surface of which you will find a green moss. As new crops of the moss grow on the surface the preceding ones are forced down; they die, and moss litter is the product. If the process is allowed to continue, and it is further decomposed, the product undoubtedly is peat, the nature of which you all know. At the same time, the chief practical difference I have seen between peat and moss litter, as shown in the working of a bog, is this: You cut the sod of moss litter and dry it, it is spongy and light, and you can break the corners off and crumble it down. Take a sod of the underlying peat, dry it, and it is quite hard, it does not break off. Moss litter, there-

fore, is the substance of the moss on the way to become peat. It has an extraordinary power of absorbing moisture, and it is used for bedding in stables. A great many of you must know that it has been well applied for absorbing moisture and ammonia. It not only absorbs moisture and ammonia, but it has the property of giving off that moisture, but still retaining the ammonia. Of course, this recommendation of moss litter will remind you of the old plan of using dry earth; but the facts are that moss litter is more effective; that is to say, one hundred pounds of moss litter will dry and deodorize eight hundred pounds of ordinary excreta, and increase its fertilizing qualities.

As to whether it is found in the United States, I have no data; but if anyone will look out of the car windows in passing from here to New York, at Valley field there are large areas of this moss litter to be seen. If you pass from Montreal by the Central Vermont Railroad, as you get towards St. Johns, you will find large areas of the same article. But it is only at Welland, Canada, near Niagara Falls, that a large area has been worked, and this is the product which I have exhibited to you to-day.

Mr. William F. Boardman, of Ottawa, Canada.—In connection with the remarks made by Mr. MacFarlane, I wish to say a few words in regard to precipitation processes. In England there is a process known as the A, B, C process, which is a precipitation process supplemented by drying and in connection with it there is made what is known as native guano, which is of a highly fertilizing nature and finds a ready sale at $17 per ton (£3.10—stg) which is a great consideration to the municipality of Kingston-upon-Thames (a town 25 miles from the city of London), where the largest works for carrying on this process are situated. These works deal with the sewage of a town of about 50,000 inhabitants; they do not treat it by the ordinary precipitation process in which lime takes a prominent part, but by this A, B, C process, containing alum, blood and charcoal, and the effluent water is discharged at once into the river Thames. It is claimed that this effluent water is so pure that fish can live and thrive in it, while on the contrary the effluent water of any lime precipitation process causes their immediate destruction. Before the House of Commons Special Committee on the Conservancy Boards Bill, evidence was given of the character of this effluent water, declaring it to be perfectly innocuous, at the same time the product is of considerable commercial value; in fact the company has received a large number of testimonials proving that native guano, the result of this precipitation process, is of real agricultural value. I thought it would be of interest to draw the attention of the Association to this fact. If any of

you desire to know anything further regarding this matter, you can communicate with the Secretary of the Native Guano Company[1] in London, England.

Mr. F. T. Shutt, of Ottawa, read a paper entitled "The Farm Well." (See p. 64.)

DISCUSSION ON THE PAPER OF MR. SHUTT.

Dr. Thomas MacFarlane, of Ottawa, Canada.—I would like to express my high sense of the value of the paper that has been read. I would only refer to the latter part of the paper pertaining to legislation, in which it is said that legislation cannot effect very much and that we must trust to education. But education is a slow process. I would call attention to the fact that the legislation at present in existence can do a great deal towards improving the state of affairs which Mr. Shutt has so well described. In every town we have health officers; in every town they have to do with the milk supply of the inhabitants. They have to do this under our Ontario law. They have the right to go outside of a city and inspect the sources of supply of milk; they have a right also to object to its sale and to cause the withdrawal of the license of the particular dealer, if the milk is not satisfactory, or if the raw materials from which it is produced are not satisfactory. If he chose to exert himself, the health officer can insist upon a better state of affairs, both as regards keeping the cattle, and the water which is supplied to the cattle, in better condition. The farm well is common both to man and beast, and health officers of towns, if they exert themselves, and are not content merely to draw their salaries, can go out in the country districts and effect considerable reform, because they have the administration of the law back of them. I think this is a direction in which they ought to work, and I believe from my own experience it is a direction in which they do not very much exert themselves at present.

Dr. Charles O. Probst, of Columbus, Ohio.—When we consider the number of cases of typhoid fever occurring in rural districts, which are in the majority of cases traceable to our wells, I think we will realize the importance of the subject that has been presented; yet the recommendations contained in the paper with reference to obtaining farm water supplies from springs or streams would not apply to my own State, in preference to securing them from the ground. I see no occasion to cast suspicion on ground water, when the surroundings are good, as they may be on the farm. I have had occasion to investigate an outbreak of typhoid fever traceable to polluted well water. It was a very interesting case indeed. In a small com-

[1] 29 New Bridge Street.

munity of less than one hundred inhabitants, there were twenty-one cases of typhoid fever. This investigation was carried on within the last three weeks. The history of the well is this: Fifty years ago an outbreak of typhoid fever occurred, there being about the same number of cases of the disease as now, and the epidemic was traceable to this well. The well was filled up with loose stones and other material and abandoned for more than thirty years. At the end of that time new owners took possession of the property; the well was cleaned out, and deepened. Formerly the well was from nineteen to twenty feet deep, it being dug through gravel soil down to the top of lime rock. The new owners, after having cleaned the well, deepened it in the rock three or four feet. The water came from between two layers of rock. The well was situated on the side of a hill, with several houses above, with no protection to their vaults, so there was every opportunity for surface pollution. There may have been subsurface pollution also. Every person in the village who had typhoid fever had used water from this well, many of them exclusively. The remaining inhabitants, who were free from the disease, had not used water from this well. While we attempted to verify the diagnosis of typhoid by the new method of Widal, and obtained negative results, it was not altogether a fair test. From the unmistakably clear history of the disease and its symptoms, there was scarcely a question as to the diagnosis, and it seems probable that the outbreak of typhoid fever was due to a second pollution of the well. I might say that, in getting at the history of the pollution of the well, it was ascertained that a woman living in a house about eighty feet from the well and above it had had an attack of fever the year before, which at that time was not diagnosed as typhoid, but as continued fever.

Chemical examination showed the well to be highly polluted, and a bacteriological examination revealed organisms probably belonging to the colon group.

Dr. James Patterson, of Winnipeg, Manitoba.—Typhoid fever is undoubtedly a disease of temperate regions, and there is no disease which we have in the western part of Canada so prevalent as it. In nearly every case the disease has been found to be due to the pollution of drinking water. I think if Mr. Shutt would recommend the abandonment of the ordinary dug wells, the danger to the community would be greatly lessened. The ordinary privy in the country is dangerous to the inhabitants. It seems to me the danger from dug wells is equally great. Wells should be bored, with iron casings, and the water should be obtained at a greater depth. I will venture to say that, in ninety-nine cases out of a hundred, the average country dug well is polluted by soakage from barn-yards and closets, and

hence we have the direct cause of typhoid fever. I have not much faith in wells lined with stone and cement, as the lining is liable to crack in our cold climate.

Dr. J. N. Hurty, of Indianapolis, Ind.—I agree heartily with what Dr. Patterson has said in regard to cementing wells. I believe, however, that it is practically impossible to keep out drainage by simply cementing a dug well, and I would recommend a driven well exclusively. Furthermore, I would recommend that the farmer have the well in front instead of in the back yard, and then he will be certain to get it away from the region of pollution. Of course, our instructions must go farther than this. The farmer must not only be instructed in regard to his water supply, but he should receive instruction how to dispose of waste in the proper way. He should be taught that almost all of the diseases from which he suffers are simply due to poisoning from his own filth.

The remarks of the essayist with reference to the boiling of water that contains toxins are very timely. Boiling water surely destroys or drives off the major portion of the toxins. In attempting to isolate the ptomaines, I believe it is impossible to do it with hot water. We must do it in the cold, and water supposed to contain toxins can, in my opinion, be rendered harmless by boiling.

Dr. F. C. Curtis, of Albany, N. Y.—I desire to refer to one point in connection with this matter of outbreaks of typhoid fever. In studying the life-history of this particular germ, the bacillus typhosus of Eberth, there is good reason to believe that it is disseminated and lives for a long period of time in our rural communities, becoming implanted in the soil, and is liable to spring into activity under any favorable condition which may exist, such as varying ground-water level; and thus elaborated is carried to the wells by succeeding rainfalls. This is particularly true in the fall season, and we can readily account for many of the outbreaks which we occasionally see—outbreaks that are widespread and fulminant in character, breaking out not probably from any particular well, but from general infection of possibly all in the entire community.

The immediate pollution of water, in another instance, comes to my mind in connection with an investigation of an outbreak in New York State, in a very rural place, a farming community, of dysentery in one family, affecting almost all of the members, half of whom died, suddenly reappearing in another family two miles distant. In close proximity to the wells were surface cesspools formed by throwing kitchen slops on the open ground; prolonged hot August weather followed by violent rain storms preceded the outbreak; bacteriological

study discovered in the cesspool slime, in the water from the well, and in the stools from the sick as well as in the intestinal contents and tissues, the bacillus pyogenes, in each case identical. Doubtless the open cesspool was first infected, perhaps aerially, and the rest followed in its natural course. It is an instructive, and perhaps unique, contribution to the pathogeny of dysentery; and it is of further interest in connection with this subject under discussion from its bearing on the well as a factor in disease production. The indifference, especially in the country, to this and other ways in which the well becomes defiled is due to ignorance, which is to be overcome by the slow process of instruction through our local health boards. And doubtless much is to be accomplished by better construction of the wells. Dr. Probst has given us an illustration of exceeding value in the well he speaks of.

Adjourned.

FIRST DAY—AFTERNOON SESSION.

The Association reassembled at 3 p. m., and was called to order by the President.

Dr. John L. Leal, of Patterson, N. J., read a paper entitled "An Outbreak of Typhoid Fever, Due to an Infected Public Water Supply." (See p. 70.)

DISCUSSION ON THE PAPER OF DR. LEAL.

Dr. Gardner T. Swarts, of Providence, R. I.—I would like to ask Dr. Leal in how many samples of water typical typhoid bacilli were found.

Dr. Leal.—Only once, I think. Dr. Connelly is here and can speak on that point, if the Association desires to hear him.

Dr. Richard W. Connelly, of Newark, N. J.—As I remember, but one sample of water was taken, and of that several plates were made, showing bacilli that were afterward identified as typhoid bacilli. There were not many colonies on each plate.

Dr. Swarts.—I would like to ask in how many cases the bacillus coli communis was found, if in any.

Dr. Connelly.—In all of the samples of water taken from the Passaic River, the colon bacillus was found.

Dr. Swarts.—In connection with that point, I should like to know whether the bacillus coli communis at any period disappeared entirely.

Dr. Connelly.—The colon bacillus was still present in the samples of water that were taken from almost any portion of the river.

Dr. Swarts.—My object in asking these questions is this: I have an unsupported theory that the bacillus coli communis is frequently an active causative factor in these epidemics of so-called typhoid fever; that what we call typhoid fever in many instances is very indefinite, and yet we have quite a number of cases of a disease closely simulating typhoid, and it would seem possible to me that the bacillus coli communis, when introduced in large numbers into the intestines, may produce a disease which clinically cannot be differentiated from typhoid fever. In one or two epidemics of so-called typhoid fever I have found the bacillus coli communis, particularly in milk and water epidemics, and I do not see why this theory is not consistent, namely, that the introduction of sewage material in large quantities into the body may produce a fever simulating typhoid fever.

The Peyer's patches of the intestinal tract are the sewage system of that system and are invaded and degenerated by the coli communis as by the typhoid bacillus, thus giving similar and indistinguishable pathological conditions. The clinical symptoms arising from the presence of the ptomaines, arising from the presence of the coli communis, are not distinguishable from those of typhoid fever. Thus it is not always essential that the bacillus of typhoid be found in the water supply, but if the coli communis is found in quantity it is sufficient to produce an epidemic which may not be distinguished from a typhoid epidemic.

Dr. Peter H. Bryce, of Toronto, presented the "Report of the Committee on the Cause and Prevention of Infectious Diseases." (See p. 71.)

Dr. Benjamin Lee, of Philadelphia, read a paper entitled "What Constitutes an Epidemic." (See p. 97.)

DISCUSSION ON THE PAPERS BY DRS. BRYCE AND LEE.

Dr. Adolph Gehrmann, of Chicago.—This is a very broad and exceedingly interesting subject and several thoughts come to my mind as I listen to these papers. In the first place, as regards diphtheria: Is the simple presence of diphtheria bacilli necessary to constitute a case of genuine diphtheria? As the diphtheria bacillus can exist in a healthy throat without causing any serious results to the individual, a question arises as to why some persons are infected and others are not. Numbers of reports have been made by Löffler and the New York Health Department, and others where bacteriological examinations have been made and the diphtheria bacilli has been found to remain alive in the throats of patients for considerable time after disappearance of all clinical symptoms and the membrane from the throat. I think it is a point that we ought to discuss to some ex-

tent, and it is certainly very important as to what shall be done with those cases in which the diphtheria bacillus continues to remain in the throat after a period of careful treatment. Are they still to be treated as cases of diphtheria? An interesting case came under my observation some time ago in a family at Evanston. For eighteen or nineteen days the diphtheria bacillus was found in the throat of a girl nine years of age. All manner of treatment was used during this period and the number and character of the bacilli did not change until the end of the period noted.

The question as to whether the cases should be quarantined and the houses fumigated until the diphtheria bacilli disappear from the throat entirely, is one that should be settled. I have been inclined to believe that we should enforce regulations depending upon the bacterial examination of the patient's throat. Even though it is recognized that considerable hardship may be suffered by the family afflicted we can never say that a given case may not infect some one who is perhaps less immunized than the individual who has the bacillus in his throat, although without any danger to himself.

In regard to the points brought out in the discussion of typhoid fever, it is a subject fruitful for discussion. There is no doubt that there is a series of clinical appearances which make a close relation between enteritis and typhoid, cases of acute enteritis being at one end of the series and typical typhoid at the other.

Those who have followed the work with Widal's test in typhoid fever, have, no doubt, met with cases in which they were unable to obtain the typical reaction, but these cases were looked upon by practitioners as typhoid. In a number of letters sent out from the City Health Department in Chicago some twenty cases were reported as typhoid in which the diagnosis could not be borne out by the blood test. The specimens were taken late enough in the disease to avoid error. It is possible that some of these cases diagnosed as mild typhoid may be some form of bacillus coli infection which closely resembles typhoid itself.

There is just one point in regard to tuberculosis that I may speak of, and that is as to the length of time that tubercle bacilli will remain alive under different circumstances. There is no doubt that we need not have as much fear of dust infection as we have had hitherto. The original experiments of Koch showing that the tubercle bacillus disappears quickly when exposed to air and sunshine upon the streets, has been entirely corroborated. The general concensus of opinon now is that in dark rooms and poorly-lighted and ventilated places the bacillus will remain alive and active for a period of about three months.

Dr. C. H. Jones, of Baltimore.—I have hesitated somewhat to speak on this subject, as I am one of the young members engaged in caring for the health of the people of a large city. I would like to speak, however, of one or two measures I have put into effect in Baltimore, the result of which we will only know sometime next year. In the first place, in regard to the question of allowing children to go to school after having suffered with diphtheria, and also whether we shall allow other children of the same household to go to school after the disease is over. I have made it a rule, and enforced it by law, that no child shall be admitted to any public school until after its throat shall have been examined by my own bacteriologist, and he declaring the throat to be free from the bacillus of the disease, after which the house shall be disinfected and the card taken down. In addition, twice a week I have a list of all houses in the city that are infected sent to the principal of every school, notifying them that such houses are infected with scarlet fever or diphtheria. Exactly what the result of this is going to be, I do not know. I believe, however, that by carrying out such work thoroughly we will do much towards effectually preventing the spread of these infectious diseases.

With reference to the relationship of diseases of the alimentary canal and typhoid fever, it is certainly a subject of great interest, and one that should be discussed very freely by members of this Association. A very interesting demonstration of the close relationship, as far as the source of the trouble is concerned, was shown by an accidental experiment in a small town close to Baltimore this summer. If Dr. Fulton, Secretary of the State Board of Health, was here, he could tell you more about the exact history of it, but unfortunately he is sick. In a few words, it amounted to this: During July or August the water supply of this town was considerably lessened by the drought. The water of a well that had not been used for a year was pumped into the reservoir, and at the end of six days there were thirty odd cases of intestinal inflammation, amounting in some cases to dysentery. In exactly fourteen days, after polluting the water in the reservoir, there developed three cases of typhoid fever.

Dr. Henry D. Holton, of Brattleboro, Vt.—I do not rise to add anything in particular to the discussion, but to ask some questions which I hope the gentleman will answer. The gentleman from Chicago (Dr. Gehrmann) referred to the fact that sometimes the Klebs-Löffler bacillus was found in the apparently healthy throat. In one town in my State, for the last two years every little while cases of diphtheria have occurred, and it was found that a number of apparently healthy citizens, who had not any connection in any way with

diphtheria cases, had the Klebs-Löffler bacillus in their throats. These people did not show any signs of sickness or of any development of the membrane in the throat. We have been in the habit of quarantining all patients who have had diphtheria until the bacteriological examination showed that there were no bacilli present in the throat. The question comes up as to what shall we do with those people who are going around with the Klebs-Löffler bacillus in their throats, and are apparently not ill? Is it fair to quarantine such people until these bacilli have disappeared from the throat, and not quarantine those in whom it exists, but are really not sick with the disease? I would like some member to give us information as to how we shall proceed in those cases. It seems to me, this explains in a measure why we have continual outbreaks of diphtheria. There are undoubtedly many persons walking about in the community with the Klebs-Löffler bacillus in their throats, who communicate it to others that are more susceptible to the disease. The old idea was that the germs did not find a proper field to germinate in, and this was one reason why some persons did not contract the disease, although they might have communicated it to others. It is important for all health officers to know just what to do under such circumstances. In a good many cases in houses where there was diphtheria, there would be members of the family who showed mixed infection from bacteriological examinations of the secretions of the throat, and yet the absence of the Klebs-Löffler bacillus was noted, and they did not manifest symptoms of diphtheria. Whether we shall take the clinical symptoms in connection with the bacteriological diagnosis, and after the throat has cleared up discharge the patient, although the bacillus may be still present, is a question. Some gentleman has recommended forty grains to the ounce of nitrate of silver for the purpose of brushing the throat, in order to destroy any bacilli that may be present after the removal of the membrane. It seems to me this is a very strong application. I hope some one will consider the questions I have propounded.

Dr. H. M. Bracken, of Minneapolis, Minn.—The quarantining of diphtheria is certainly an interesting question. It seems to me that those who are so unfortunate as to have the Klebs-Löffler bacillus present in their throats ought to be quarantined, whether they show clinical evidences of the disease or not. The school referred to by Dr. Bryce is an interesting illustration. It is a school made up of children taken from various parts of the State. Diphtheria was at one time present clinically among the inmates of this school; it is not present clinically now, and probably has not been for several months

among those who are residents of the school; but new children coming into the school are almost certain to have clinical manifestations of the disease, and the germs are still present in the throats of many residents who do not show clinical evidences of the disease. It has been demonstrated that these latter are capable of spreading infection. It has been possible by careful isolation to reduce the number of those having the germs present, without clinical symptoms. When we know that a person is carrying a possible means of infection about, we should quarantine him or her, as the case may be, whether they have clinical symptoms of the disease or not. The rule adopted in the State of Minnesota as to quarantine is four weeks as a time limit, or two negative bacteriological reports.

Dr. Charles V. Chapin, of Providence, R. I.—We have not made many tests to determine the frequency with which diphtheria bacilli are found in the throats of well persons who have not been brought in contact with the sick; but what few tests we have made would lead me to think that it is comparatively rare to find a Klebs-Löffler bacillus present except in persons who have been brought in contact with those suffering with the disease. The diphtheria bacillus when found in the throat of a person is dangerous, both to that person and to the public, for we have quite a number of cases on record of persons found perfectly well with diphtheria bacilli present in their throats who afterwards, in the course of a few days or weeks developed clinical diphtheria, and in some cases died. We have records of cases with bacilli in the throat carrying the disease to others in a virulent form. It has therefore been our custom for a year past to isolate all persons in whom we found diphtheria bacilli present. We examine the throat of every person in the family whenever a case occurs in that family. In over twelve hundred cases, we found that about fifteen per cent. of the members of infected families had the bacilli of diphtheria present in their throats, although they were not sick. When adults are not brought in contact with children, the proportion is less. Out of six hundred and fifty-three adults, including both men and women, we found seventy-four persons, or eleven per cent., who were well, who had bacilli present in their throats. Of these seventy-four adults only fourteen were men, the others were mothers and nurses.

I will speak of one interesting epidemic we had last winter. We had an orphan asylum with some three hundred children in it, and had a case of diphtheria develop, and in the infirmary we found in examining the children that several of them had sore throats. We found diphtheria bacilli present, and some of them became quite sick

in a day or two; in fact, some seven or eight cases of clinical diphtheria developed in this infirmary, where there were twenty children. At that time I called in Dr. Swarts, secretary of our State Board of Health, and on his advice cultures were taken from the throat of every child in the institution, and in many cases repeated cultures were made. The bacilli were present in a considerable number of these children who were not sick and who did not develop the disease. One or two who had the bacilli and were at first well, did afterwards become sick. All who had bacilli were isolated until the bacilli disappeared. In the course of a few weeks diphtheria was banished from the institution, and we have not had a case there since. It is interesting to note that diphtheria bacilli were first found in the throat of a child who came to the infirmary of this asylum from an institution where there was diphtheria. It is probable that the infection was carried by that child, although it presented no clinical signs of diphtheria.

Dr. Charles O. Probst, Columbus, Ohio.—I wish to ask for information. We have so many laboratory men present that I think they can help us very materially. We are establishing a State Board of Health laboratory. I should like to know what to do when the physician reports a case of diphtheria to us, a culture is made, sent to the laboratory, and the Klebs-Löffler bacillus is not found. Shall we take the responsibility, if we do not find the bacillus, of reporting to the health officer that it is not diphtheria, and that quarantine may be dismissed? If a mistake of that kind should occur, and the case should prove to be one of diphtheria after all, it would be serious for the health officer and for us. I would like to know what is the rule with some of the health officers where they fail to find the Klebs-Löffler bacillus present.

Dr. H. M. Bracken, of Minneapolis, Minn.—Once in a while we run against a case of diphtheria in which the Klebs-Löffler bacillus is not found at the first examination. In such a case a report is given to that effect and a second culture is asked for. We do not make a negative diagnosis of this disease on the strength of one culture.

Dr. Frank W. Wright, of New Haven, Conn.—I believe among school children that there are more cases of clinical diphtheria than we are led to believe. I have been surprised in the last few years, since bacteriological cultures have been made, at the number of cases that were not considered clinically diphtheria, but which showed the diphtheria bacilli present in the throats. For that reason a great many children do not come under the doctor's care, and still they continue to attend school. Those children that are sick and have a

physician are excluded from the schools some four weeks from the commencement of the disease, which is long enough to keep them out of school. The children all go to school in our town at the end of four weeks.

Dr. James W. Patterson, of Winnipeg, Manitoba.—Just before I came to this meeting our bacteriologist had three cases in one family where he found the bacillus present—in one case thirty days; in another, thirty-five days, and in the other, forty-five days—after all evidences of the disease had disappeared from the throat. In using a swab and depending upon bacteriological diagnosis a great deal of care must be exercised in taking the specimen from the throat. Very frequently mistakes are made by carelessness in the application of the swab to obtain the specimen, and I have no doubt some cases are pronounced non-diphtheritic when this disease is really present.

Dr. James C. Burroughs, of Asheville, N. C.—I believe the bacillus of tuberculosis and infection of the lymphatics of the cervical glands, together with the adenoid tissue on the walls of the throat, are prolific sources of infection of this disease. The greatest thing that confronts health authorities of the country is the prevention of tuberculosis. I believe all tuberculous patients should be placed under the care of health officers and carefully watched, and as soon as a case develops the sputum should be destroyed. Every care should be taken of the room occupied by the patient; it should be thoroughly sterilized when he leaves it. Tubercular houses are the source of more trouble than any other one thing, and some of them should be burnt up.

Dr. Benjamin Lee (closing the discussion).—I believe that it is pretty generally understood that a disease which is always present in a community, within moderate limits, is to be called an "endemic, not an epidemic." Of course, an endemic may become epidemic. What I claim is, that a communicable disease which rapidly spreads from person to person by infection exists in epidemic form, and we need not wait for the Klebs-Löffler bacillus to be detected or dozens of cases to occur before declaring an epidemic.

Dr. U. O. B. Wingate, of Milwaukee, Wis.—This question is one of considerable importance to us as health officers, in that we should know exactly what we mean by the word epidemic. In many of the states the law provides that boards of health shall have certain powers when an epidemic is declared. What is an epidemic in the legal sense? I would like to suggest that this Association define what it is from a sanitary standpoint, in order that we may have something to

guide us. At the present time we only have the definition given by Rohé in his excellent work on hygiene. It seems to me very important that we should have some settled definition, when we go into court, as to what an epidemic really means.

Dr. J. F. Hurty, of Indianapolis, Ind.—It may be a little late to ask another question, after Dr. Lee has closed this discussion. We have thoroughly answered the question whether or not we shall quarantine persons who have the bacilli of diphtheria in their throats. But my question is, "Shall we quarantine the physician who uses his finger for a tongue depressor, and then wipes it on his trousers?" Undoubtedly we have physicians in every State in the Union who do this.

Mrs. Ellen H. Richards, of Boston, contributed a paper on "The Urgent Need of Sanitary Education in the Public Schools," which was read by Dr. Mitchell in the absence of the author. (See p. 100.)

DISCUSSION ON MRS. RICHARDS' PAPER.

Professor Franklin C. Robinson, of Brunswick, Maine.—If there is no one else who wishes to discuss this paper, I would like to say a word or two with reference to that part of it which recommends the preparation of a text-book on the subject of sanitation to be introduced into our schools. I agree in the main with the other portions of the paper. But I think we ought to be careful how we commit ourselves. There is no reform of any kind which starts but what the first thing thought necessary to make it absolutely successful is to prepare a text-book and put it into the public schools. It seems to me a mistaken idea entirely. Teaching by precept and example is all right, and our school-houses should be santiary. But it does seem to me that we misconceive the purposes of the public school when we think we can accomplish by such means the end that is desirable. There are too many things taught in the public schools already; the thing we want to do is not to burden the minds of children with facts which are so arranged as to be almost useless when they grow older. Many things are stated and taught in such a way to children that they have to be unlearned when they get older. But the thing we do want to accomplish is that children be so trained as to discriminate, when they get older, between what is right and what is wrong. That is to say, they ought to be taught to use their minds rather than to have so many things brought to their attention. And so I feel that I should say something in connection with the paper on this subject. I have had something to do with schools for a great many years, having been a superintendent of schools for twenty-one years in a town of some six thousand inhabitants, and I noticed the

effect of those things. So I speak from experience. I should therefore be very reluctant to recommend the preparation of a text-book or primer along this line, with the purpose of using it in the public schools.

Dr. Albert L. Gihon, U. S. Navy.—I think Professor Robinson is right in regard to the matter of reaching the pupils by text-books in our schools. We teach them grammar in all our schools, yet I think you will hear, if you keep your ears open, in most of the street cars, more bad grammar from children that have been in schools than you will find good.

As to the matter of teaching hygiene, I have seen in one text-book in particular an illustration of a blood-red stomach supposed to be possessed by the father of a child who was not a total abstainer, which is enough to frighten any child. There is no doubt about it that most of the sickness and loss of life during our late war were due to the ignorance of the men. Of this every competent military surgeon is satisfied. Take a raw regiment and you will see how persistently its members will violate every sanitary precept. I do not think, however, that by getting up a primer and educating boys in our schools that they will be any more disposed to observe sanitary laws when their turn comes to fight in the next war. We have got to do other things. While it is very proper to teach people sanitary precepts, sanitary A, B, C's, I do not think it is going to accomplish the proposed object.

Mr. William Paul Gerhard, of New York City, contributed a paper on "Hygiene of Theatres," which, in the absence of the author, was read by Dr. Hurty. (See p. 103.)

On motion of Professor Robinson, the Association adjourned until 8 P. M.

FIRST DAY—EVENING SESSION.

The Association, with its invited guests and the general public, reassembled at 8 P. M. in the City Hall and was called to order by Dr. John Sweetland.

Prayer was offered by the Rev. William Moore, D. D., after which addresses of welcome were delivered by the Hon. Sydney Fisher, M. P., Minister of Agriculture; by Sir James Grant, K. C. M. G.; by His Worship Samuel Bingham, Esq., Mayor of Ottawa, and by Alderman W. G. Black. (See p. 14-25.)

The response to these addresses was made by the President, Dr. Lindsley. (See p. 26.)

Dr. Mendizabal responded briefly to the addresses of welcome on behalf of the Mexican delegation.

Dr. Lee, the First Vice President, then took the chair, and the President, Dr. Lindsley, delivered his annual address. (See p. 1.)

SECOND DAY—MORNING SESSION.

The Association met at 9:30 A. M. and was called to order by the president. A number of applications for membership, acted upon by the Executive Committee, were referred back to the Association with the recommendation that they be elected to membership.

Dr. Montizambert.—I move that the secretary be authorized to cast the ballot of the Association in favor of the election of the gentlemen whose names have been recommended by the Executive Committee. Carried.

This the secretary did, and they were declared duly elected.

The Secretary.—The Executive Committee has considered the following resolutions that were referred to it. These resolutions are to be added to the resolutions in reference to the Bertillon classification, which have been adopted by the Association. The resolutions are as follows:

Resolved, That the American Public Health Association approves the general principles and plan of procedure relative to the periodical revision of the Bertillon classification of causes of death as submitted by the Committee on Demography and Statistics in their Sanitary Relation.

Resolved, That commissions of three members be appointed by the president of the American Public Health Association at this meeting, subject to the approval of the Executive Committee, from each of the countries represented in the Association, to act jointly with each other and with similar commissions from other countries in the revision of the Bertillon classification of causes of death; and that said commission shall be authorized to adopt such necessary rules, in conjunction with other countries associated in the work of revision, as shall be necessary for its successful conduct; they shall report progress to this Association at each annual meeting, and shall be continued until the work of revision is completed and their successors selected for the next periodical revision.

Resolved, That the governments of the United States, Mexico and Canada be likewise requested to make this classification the basis of the mortality statistics of the censuses of 1900 and 1901.

On motion, the resolutions were adopted.

Dr. Wingate.—I have a resolution I would like to offer at this time, and request the Association to consider it.

The resolution was read by the secretary as follows:

Resolved, That a committee of five be appointed by the chair for the purpose of drafting, and presenting to this Association for adoption, a definition of the term "epidemic" for the guidance of health authorities in executing such laws as call for the declaration of the presence of an epidemic. (Referred to the Executive Committee.)

The secretary called the roll of the Advisory Council.

Dr. Henry B. Horlbeck, of Charleston, S. C., chairman, read the "Report of the Committee on the Etiology of Yellow Fever. (See p. 116.)

Dr. Eduardo Licéaga, of Mexico, presented a further report on "Etiology of Yellow Fever." (See p. 128.)

He also presented a second paper entitled, "Seventh Report on Yellow Fever." (See p. 135.)

DISCUSSION OF THE PAPERS OF DRS. HORLBECK AND LICÉAGA.

Dr. A. Walter Suiter, of Herkimer, N. Y.—I desire to say a word or two in conection with the subject of yellow fever. In the first place, I wish to extend my personal thanks to my distinguished friend, Dr. Licéaga, for the papers he has just read. I would like to ask him a question with reference to the relation of paludal fever, and what is called *la calentura* (which prevails about Tampico), to yellow fever proper. I observed that in his paper he stated that immunity against yellow fever was found to be caused by numerous febrile diseases of a mild type, these furnishing immunity to the individual after he has passed through them. I have had some experience in observing the fever referred to near Tampico, and I would like to ask whether or not observations have been made by the Superior Board of Health of Mexico, or any other health department, with reference to the disease *la calentura* and yellow fever proper. Furthermore, I would like to ask a question as to what relation the paludal fever commonly observed in and about Tampico bears to *la calentura.*

Dr. Gihon (speaking for Dr. Licéaga).—Dr. Licéaga desires me to state that they do not use the term "*la calentura*" there. They do not speak of it as a disease in Tampico, but they do recognize a marshy or malarial fever, which prevails in the spring, which, however, is not at all like yellow fever. A distinction is made between the two affections by recognizing the presence of the organism of Laveran. The most efficacious means of establishing the etiology of yellow fever, says Dr. Licéaga, is to discover the germ which produces it. Towards this end, as Dr. Horlbeck has just stated, all the efforts of this Association should be directed, but until that germ is unmistakably established, it is necessary to define clearly every other etiological fact relating to yellow fever, in every one of the countries

where it appears, and this is the purpose of the paper which Dr. Licéaga has presented.

Dr. A. Walter Suiter, of Herkimer, N. Y.—I desire to say further, after hearing the remarks of Dr. Licéaga (as translated by Dr. Gihon), that there is a disease about Tampico which occurs in epidemic form. I myself saw an epidemic there several years ago at a town near Tampico of about five hundred inhabitants, a great many of whom were dying from this disease at a rapid rate. The disease was designated by the name *la calentura.* I was requested to visit the patients, which I did, and made some observations. I took the disease to be something like what we term pernicious malarial fever, which, as Dr. Licéaga has said, is characterized by the presence of the organism of Laveran. What I wish to know is, whether or not any observations have been made to show that the disease *la calentura* occurring in an individual would furnish immunity thereafter to an attack of yellow fever, because Dr. Licéaga stated in his report that the occurrence of mild fevers, paludal in character, in many instances would furnish such immunity.

Dr. C. P. Wilkinson, of New Orleans, La.—In connection with the remarks made by Dr. Suiter, I wish to say that all along the coast of the Gulf of Mexico there is a paludal fever which is called *la calentura.* That is the name given to it by the Spanish-speaking people. It is nothing but malarial fever, is attended by little mortality, and it never confers immunity to the individual as to other attacks.

Going back to the paper of Dr. Licéaga and discussing the question of grain, coffee and sugar bags, as carriers of infection, I do not think the question of communication of the disease by personal apparel on board of these vessels has been sufficiently emphasized. Having been connected with the quarantine service of Louisiana for the last eighteen years, I have reason to think that yellow fever is but rarely imported by means of grain or coffee bags. On the other hand, I believe the germs of the disease are imported by the clothing of sailors and of engineers, as well as by the personal wearing apparel of the officers of the vessels.

With reference to the bacillus of Sanarelli, it is practical of no value. Our present knowledge gives no reliable testimony as to whether this germ is invariably the cause of yellow fever or not. Sanarelli informs us that he has found it in a certain number of cases of yellow fever. It is of no value to us in diagnosing the first case of yellow fever to prevent an epidemic. It may be of some value in cases of medical jurisprudence.

Dr. Horlbeck has told us that the bacillus of yellow fever is destroyed at a temperature of fifty degrees. A gentleman from Ann Arbor (Dr. Novy), who has been conducting some experiments along this line, has said that a temperature of ten degrees C. for three days did not destroy the bacillus of this disease. I wish to remark in this connection that we have many cases of yellow fever after frost has occurred. We have places in the South, where patients infected with the disease have been subjected to a temperature below thirty-two degrees for several days, and yet the germs have not been destroyed.

Dr. Samuel Westray Battle, of Asheville, North Carolina.—It seems to me that, in discussing the matter of yellow fever and the etiology thereof, we have lost sight of *the element of darkness* as an important factor in its production, and it is a phase of the subject which has received very little, if any, attention. Careful, practical observers have noted the fact that, *as the solar rays get less and less strong, the disease becomes more rife*, the bacillus, perhaps, proliferating and getting in its work *under cover of the darkness*. As night comes on it is believed by many that the germs then enter the system. If *this* be the case, then the electric-light rays ought to do the work of the solar-rays, since, by spectral analysis, electric light is almost identical with solar light; so that with low altitude, moisture and heat, the element of darkness deserves to be carefully studied, and should prove to be very interesting in its causative relation to the continuation and spread of the disease. Practitioners who have had a ripe experience in epidemics of yellow fever have told me that people could sleep *outside* of an infected city, going in during the sun hours, transact business and *enjoy an immunity* from the disease. I, myself, have seen something of yellow fever, though little in recent years, and I believe that this is true. And along that line it has occurred to me that, as the solar rays are opposed to the yellow fever bacillus, the electric light might be made useful—for, since, practically, electric light is solar, dark streets and places might be lighted by a constant electric sun. This experiment could be easily carried out on shipboard, and every nook and cranny and crevice of an infected ship brilliantly illuminated and the epidemic speedily controlled. I simply throw this out as a suggestion, with the hope that something may be done to control a disease which is so subtle in its infectiousness, the specific morbific agent of which has steadily baffled the world.

At the conclusion of the discussion, Dr. Gihon offered the following resolution:

Resolved, That the report of the Committee on the Etiology of Yellow Fever be accepted and printed in the transactions, and the committee be continued; and that a committee of seven be appointed by

the chair to wait upon the President of the United States with a view of obtaining a bacteriological commission to go to Havana to study the cause and prevention of yellow fever. Seconded and carried.

Dr. Ernest Wende, of Buffalo, chairman, presented the "Report of the Committee on the Cause and Prevention of Infant Mortality." (See p. 140.)

Dr. Gihon moved that the report be accepted and the committee continued. Carried.

Dr. A. Walter Suiter.—I desire to introduce a resolution in this connection which pertains to the points brought out in the excellent paper of Dr. Wende. The resolution is as follows:

Resolved, That it is the sense of this Association that all State, city and town health authorities and medical societies generally should exercise every possible effort to procure the enactment of laws in their respective cities, villages and towns to prohibit the sale of the so-called long rubber tube nursing bottle, as being a perniciously active agent in the causation of preventable diseases of infancy of a most serious character and fatality. (Referred to Executive Committee.)

The president appointed as a committee of seven, called for in the resolution offered by Dr. Gihon, Dr. H. B. Horlbeck, Charleston, S. C.; Dr. Geo. M. Sternberg, Washington, D. C.; Dr. C. P. Wilkinson, New Orleans, La.; Dr. S. H. Durgin, Boston, Mass.; Mr. Josiah Hartzell, Canton, O.; Dr. A. H. Doty, Staten Island, N. Y., and Dr. J. Y. Porter, Jacksonville, Fla.

Dr. Irving A. Watson, of Concord, N. H., read a paper on "Some Observations on Bovine Tuberculosis in New Hampshire. (See p. 147.)

Dr. E. A. de Schweinitz, of Washington, D. C., read a paper entitled, "A Convenient Method for Staining Tubercle Bacilli." (See p. 157.)

DISCUSSION OF THE PAPERS ON TUBERCULOSIS.

Sir James Grant, of Ottawa, Canada.—I desire to say a few words on the subject of tuberculosis. We know perfectly well that there is no subject at the present time which is occupying a greater degree of scientific investigation than that of tuberculosis. Not only here, but in the American republic and in Great Britain scientists as a whole are devoting an immense amount of attention to investigations with reference to the spread of this disease. In the Province of Ontario the people have received an elaborate report from Dr. Bryce within the last twelve months, showing that the mortality from tuberculosis exceeded all other deaths. Now, it is an extraordinary fact in this age of progress and scientific investigation, when people are fed on the

best quality of food, with plenty of fresh air and good clothing and all the other requirements, we should find the spread of this disease to such an extent as we do. I was much impressed with one observation made by Dr. Watson, which I think is paramount in its character, and ought to draw scientists far and wide to its vast importance, namely, the spread of tuberculosis in cattle. Inquiring into the statistics of animals in various countries of Europe, particularly Holland, Belgium and Germany, we find that the excellence of their products in the British markets is largely attributable to the sanitary measures they adopt with reference to the preservation of health in their cattle. There you find no cattle segregated together in cloistred stalls with impure atmosphere, bad ventilation, with imperfect cleanliness, such as is ably defined by Dr. Watson in his paper. In reading his paper we should take a lesson that ought to be deeply impressed upon the minds of all those people who are now concerned in the distribution of milk as a product of health and as a food of our people. Also, more particularly, if this question is investigated with that degree of care and precision which it merits, it will tend materially to curtail the spread of this disease. For that reason, and that alone, the sanitary department of the British Medical Association, held at Edinburgh a few weeks ago, have insisted that each section where cattle are brought together for the distribution of milk shall be thoroughly examined; that the stables and animals shall be carefully inspected at short intervals to see whether or not there is anything tending towards the spread of the disease. I take it that if the principles so admirably enunciated to-day by Dr. Watson are carried out, your Association will accomplish a work of an imperishable character.

Let me tell you this, that there is no subject more worthy of careful scrutiny and investigation than that with reference to our schools. Our children are brought together in hundreds, collected in one room without sufficient ventilation, and yet their lungs are not the seat of tuberculosis. Why? Because we know there is nothing in the treatment of tuberculosis equivalent to isolation. We see the vast importance of this fact, that consumption is now looked upon as an infectious disease and is vastly different to what it was a few years ago. I think our schools ought to be examined by a medical expert several times a year, and the children and teachers reported upon to see if there is any prospect of a germinal influence of a tuberculous character disseminating the disease.

To repeat, there is no subject before the people to-day that is receiving more investigation and minute scrutiny than that of tuberculosis, and for that reason I was extremely pleased and gratified to

have listened to the able and instructive paper of Dr. Watson. I trust it will be widely circulated; it will be the means of curtailing the spread of the disease. Tuberculosis is now being considered most seriously by the people of both Great Britain and Canada.

Dr. J. I. Gibson, of Denison, Iowa.—I enjoyed Dr. Watson's paper very much, as it comes in line with the work in which I am engaged; yet I am afraid he has gone perhaps a little too far in one direction. He seems to advocate the tolerance of tuberculous cattle to too great an extent in his paper. Dr. Watson spoke about veterinarians in his State being able to diagnose satisfactorily an animal that is dangerous to the public health by clinical examination. In the West we do not consider ourselves quite that clever. I would like to ask the doctor a question or two. If, after a careful tuberculin test of a dairy cow, there is a positive reaction indicating tuberculosis within the system of the cow, would you use such a cow for your family cow, or advocate the use of it by your neighbor? There seems to be back of Dr. Watson in his State the very same trouble that we all experience. It is the almighty American dollar, which is even worse than two Canadian half-dollars. (Laughter.) In my work in the State of Iowa, I quarantine a tuberculous cow as soon as it is shown that the cow has tuberculosis by the tuberculin test, as rigidly as I would quarantine a glandered horse, so far as her connections with the dairy are concerned. It is true, that more than two-thirds of the cattle that react to the tuberculin test will pass the United States Bureau of Inspection at the packing house, which has to do with the proper disposal of tuberculous cattle. In the slaughtering room the animals are passed upon according to the conditions found. In this connection I desire to cite a case. One of my assistants, in answer to a call for the veterinary department, was sent to the town of Reinbeck, Iowa, to test a few cattle owned by a certain man. One of the cows had an extensively diseased udder. Only six weeks before this time the family had determined that this cow's milk was not fit for consumption, and they had decided to give her milk to a number of young pigs (I believe twenty). At the time Dr. Griffith examined the cow and slaughtered her, his attention was called to the condition of a few of the pigs that were left, and on making post-mortem examination found well-defined tuberculosis affecting them.

Dr. H. M. Bracken, of Minneapolis, Minn.—I was much interested in the paper of Dr. Watson. I believe there has been too much condemnation of the meat of animals that have responded to the tuberculin test. This paper will probably have an influence against the tuberculin test, and this I regret. I think it is generally conceded

that the milk of an animal may be unfit for food without the presence of tuberculosis in the udder. It seems to me the tuberculin test should still be used vigorously. Any animal that responds to this test should be condemned as a milk producer; the milk may be perfectly safe, but we do not know that it is so. The tuberculin test, however, does not determine the amount of infection or the amount of involvement. It simply marks the animal as unfit for use as a milk producer. It is a fact that many of these animals are but slightly affected and that the meat of such is perfectly safe for market. If we condemn the meat of every animal that responds to the tuberculin test we will have the opposition of dairymen. I will give an experience that occurred in my own State. A herd was tested with tuberculin and several animals responded to the test. The dairyman, not understanding the attitude of our board in dealing with such cattle, objected to their quarantine, but when the facts were explained fully to him he withdrew his objection. Eight animals were killed under careful inspection. The carcasses of seven were passed as fit for food. The dairyman was well satisfied with the result. Had we condemned the meat of all these animals as a result of the tuberculin test, we would have done the dairyman a great injustice and at the same time secured for ourselves his ill will.

Dr. Peter H. Bryce, of Toronto, Ont.—Naturally we are all interested very much in the most admirably prepared paper of Dr. Watson, and I congratulate him on the excellent management of the Queen's English in drawing his conclusions in so satisfactory a manner, and I think every gentleman present will agree with me that they are perfectly true. Taking them in order, the first one is to this effect: Dr. Watson says he does not expect to eradicate entirely tuberculosis, but it may be very much reduced. I would in practice, though not in theory, agree with him. The next is, that, ordinarily, before a clinical diagnosis of tuberculosis in cattle is possible, they are probably not dangerous. That is true. And the third proposition I agree with most heartily, namely, that the methods of dealing with the disease most satisfactorily, so far as prevention goes, must be from a sanitary standpoint. But looking at the question from a practical standpoint of how we are going to accomplish these results, I think we will find, as one of the previous speakers has said, that Dr. Watson's proposition will not hold water. I mean this: Take a young person who is probably beginning to lose flesh; is a little dyspeptic and anemic, and goes to a physician. Fortunately, in almost all of such cases, we can determine absolutely whether they are tuberculous or not by applying the microscopic test for discovering the tubercle bacillus. Such a patient is, however, apparently

well; he is in that state in which he is not dangerous to any one; but it is a fact that such a patient is going to be a source of infection to others at some time or other, and the disease will increase if we do not recognize the fact and act promptly. Similarly, if a cow prove to be tuberculous, we cannot afford to drain the cow's system by milking her if we wish to stop the disease. Therefore, in the case of a cow giving milk, I take it that if tuberclized and if we want to save her for meat, we ought to diagnose her in the earliest stage (and this can be done by the tuberculin test), when her system is able to respond to sanitary treatment, and the cow may be fattened and at the same time taken from the sphere of possible danger without loss to the farmer who may own her and also without loss to the State. If we are going to deal effectively with a tuberculous cow; if we are going to prevent loss to the State and owner; if we expect to prevent dangerous results from such tuberculous cow, we must, necessarily, diagnose our cases at the earliest possible moment, recognize them as tuberculous, and deal with them promptly at that stage and not by indiscriminate slaughter. I agree that such a method as that has long past, but we must realize the possible and certain dangers to the public if we recognize the position taken by Dr. Watson, as well as in practice the impossibility of making serious progress toward stamping out the disease.

Dr. Samuel H. Durgin, of Boston, Mass.—The paper of Dr. Watson and the discussion which has followed, remind me forcibly of an excellent remark made by the minister of agriculture last evening in his address of welcome, and that is, if we are to pursue sanitary work, we must have the people with us; the moment we attempt to unduly force radical measures, the people who are now well informed in regard to very many of these so-called professional subjects will begin to inquire as to whether these radical measures are absolutely necessary, and if they regard them as unnecessary, they are quite able at the next meting of the Legislature, to secure a repeal of the law which has authorized such radical measures. Examples of this may be found in the two States which have been mentioned this afternoon, in Massachusetts, in New Hampshire, and I am just informed in Connecticut also. In New Hampshire the law has been perpetuated and rational measures are continued. In Massachusetts radical measures have been cut short by the people.

Dr. W. C. Woodward, of Washington, D. C.—In reference to the suggestion of Dr. Durgin, it seems to me the question arises, Who are the people? Are they the dairymen or the people of the community who consume the milk? Who shall we attempt to satisfy,

the producer or consumer? Possibly in a farming community farmers will have their way, but certainly in a community such as that from which I come the consumer is the person who will demand radical measures. We have now a reasonably good law as to the sanitary condition of our dairy farms, and I may say that during the three years in which it has been in operation it has been quite satisfactory. Every stable must have a certain amount of floor space, a certain amount of air space, and must be inspected before a man can get a permit to produce in it milk for sale. Dairymen in the neighboring States—Virginia and Maryland—must conform to similar conditions before they can bring milk into the District of Columbia. The law is strictly enforced, as well as any other law. Of course, we find a certain percentage of violations of all of them.

With reference to tuberculosis, we find a large number of dairymen coming in voluntarily and asking that the tuberculin test be applied. When they are willing to sacrifice their infected cattle, we apply the test for them without charge. There is, however, no compulsory application of the tuberculin test. But as I say, the people demand it and the dairymen are beginning to realize its importance. I think the position taken by Dr. Bryce is the proper one. If we were able to keep cows known to be infected under observation each day or each week, it might be possible to rely on physical tests, but where we make an inspection once in three months it is absurd to let a cow stay there, trusting to the farmer to report the progress of the case. I favor the immediate slaughter, under inspection, of infected cows, believing that they should not be allowed to remain in the dairy herd.

Dr. E. A. de Schweinitz, of Washington, D. C.—I desire to ask one or two questions. I understood Dr. Watson to say in his paper that six out of eight cases were found tuberculous, and the other two that responded to the test were not found tuberculous. I would like to know if the disease in those cattle not found tuberculous was not pretty well advanced, and if they did not have an abnormal temperature at the time the test was applied. All of these points have to be taken into consideration. A very large number of reports are sent in from different States to the Bureau of Animal Industry, and the application of the tuberculin test shows that while there have been some errors made in the use of tuberculin, they are small indeed. It was never claimed that tuberculin was infallible as a diagnostic measure, but it shows more than the physical examination which is made by the average veterinarian. Possibly two-tenths per cent. of the cases examined by tuberculin may be found incorrect. Taking all the data into consideration, I doubt whether the percentage would be

as high as that. It was never intended when tuberculin was used and a herd examined, that those that responded to the test were to be killed and gotten out of the way and the rest left in the stables exposed to reinfection. If animals are found to react to tuberculin, they should be quarantined and kept apart, so that every possible chance of infecting other animals may be avoided. The advisability of killing these reacting animals must be determined by the conditions and possibility of keeping them isolated and using for breeding.

Dr. Watson (closing the discussion).—There is a slight misapprehension on the part of some of the members as to the exact purport of some of the points made in my paper. I did not take the ground that tuberculin is not a valuable test, by any means, and the most valuable test we have. It is not, however, infallible. After examining a herd by means of the tuberculin test we are not sure but what a case still exists in that herd. We have to consider the almighty dollar. That is one of the things which all of us have to deal with. If we did not have to consider it, we could have sanitary science, municipal, State and National, developed to an admirable degree of perfection. But the question of money is one that concerns us very largely in dealing with the subject of tuberculosis, and in New Hampshire we have acted along those lines which would secure not only immediate but permanent results. We are pursuing a course which we believe will accomplish the most good eventually for the State. Massachusetts and Connecticut are examples of attempting to eradicate the disease at once through the tuberculin test. Now, they are left without any resources. Upon carefully reading my paper after it shall have been printed in the transactions, I think you will see that some of the objections raised in the discussion are really met in different parts of the paper. There was another object in the paper also, and that was to draw out a discussion, which it has done, and I am gratified at the manner in which my paper has been received.

Adjourned.

THIRD DAY—MORNING SESSION.

The Association met at 10 A. M. and was called to order by the president.

After some announcements by the chairman of the Local Committee of Arrangements, the Association proceeded to the transaction of routine business.

The Secretary.—The Executive Committee reports back the resolution offered by Dr. Wingate at a previous session of the Association and recommends its adoption. (See p. 328.)

THE PRESIDENT.—You have heard the recommendation of the Executive Committee on the resolution offered by Dr. Wingate. What disposition will you make of it?

DR. GIHON.—I move that the recommendation of the Executive Committee be concurred in. Carried.

THE SECRETARY.—The Executive Committee reports back the resolution offered by Dr. Suiter, and wishes to say that in the opinion of the committee, it is inexpedient to recommend its passage. (See p. 331.)

On motion, the action of the Executive Committee on this resolution was concurred in.

Dr. Frank W. Wright, of New Haven, offered the following resolution, which was read by the secretary:

Resolved, That a special committee of five be appointed, consisting of the incoming president, secretary, treasurer and two members of the Association, to be named by the president, to consider the advisability of issuing, instead of the annual reports of the Association, a periodical devoted to santiation and hygiene; and that the committee be instructed to inquire into all questions pertaining to the publication of a first-class journal and report at the next annual meeting of this Association. (Referred to the Executive Committee.)

The next thing in order was the report of the treasurer, which was read by Dr. Henry D. Holton, of Brattleboro, Vt.

HENRY D. HOLTON, TREASURER, IN ACCOUNT WITH AMERICAN PUBLIC HEALTH ASSOCIATION.

1897.		Dr.
October 19	To cash on hand	$821 98
	To cash from sale of Transactions	273 47
	To cash from dues of members	1,895 00
	Total	$2,990 45

1897.	*Disbursements.*	Cr.
November 6	By cash paid Treasurer, order No. 59, expenses Philadelphia meeting	$ 43 87
November 8	By cash paid Secretary, order No. 60, expenses Philadelphia meeting	73 92
November 16	By cash paid Nellie S. Abbott, order No. 62, postage, telegrams, and expressage	15 93
December 3	By cash paid C. O. Probst, order No. 63, postage, telegrams, and expenses to Concord	101 05
December 13	By cash paid Champlin Printing Co., order No. 64, printing and postal cards	11 75
December 13	By cash paid Wm. Whitfoar, order No. 65, reporting Philadelphia meeting	139 19

December 13—By cash paid A. H. Sawyer, order No. 66, engrossing Watson resolutions	8 00
December 27—By cash paid Charles Poulalion, order No. 67, translating report of Dr. Monjaras	40 00
1898—	
January 3—By cash paid J. M. Stewart Sons Co., order No. 68, packing and shipping desk	4 89
March 1—By cash paid Republican Press, order No. 69, printing and binding Transactions	110 69
March 12—By cash paid Sherman & Jenne, order No. 70, insurance on books	25 00
March 25—By cash paid Champlin Printing Co., order No. 71, printing	25 25
May 25—By cash, C. O. Probst, order No. 72, copyright, postage, telegrams, and express	23 78
July 11—By cash paid J. G. Adami, order No. 73, expenses bacteriological report	37 45
July 11—By cash paid Charles Smart, order No. 74, expenses distributing bacteriological report	7 79
September 21—By cash paid Henry D. Holton, order No. 75, office expenses, storage Transactions, express	154 37
September 21—By cash paid C. O. Probst, order No. 76, clerk hire, telegrams, postage	261 13
September 21—By cash paid Rumford Printing Co., order No. 77, printing, as per bill	595 61
September 21—By cash paid Champlin Printing Co., order No. 78, printing, as per bill	87 75
September 21—By cash on hand*	1223 03
Total	$2,990 45

*This includes balance of Index fund unexpended of $493.48.

On motion of Dr. Horlbeck, the treasurer's report was received and referred to an Auditing Committee, appointed by the chair, consisting of Drs. Irving A. Watson, Frank W. Wright and Peter H. Bryce.

Dr. Manuel Septien, of Queretaro, Mexico, read a paper, entitled, "Compulsory Vaccination Ought to Be Imposed as a Paramount Necessity." (See p. 161.)

DISCUSSION ON THE PAPER OF DR. SEPTIEN.

Dr. J. C. Shrader, of Iowa City, Iowa.—In the State of Iowa the State Board of Health has adopted a resolution requiring all children, before entering the public schools, to present marks of having been successfully vaccinated. It is held that we have not the right to pass a law to compel every one to be vaccinated, but we can control the matter in this way, and it has been considered by our best legal

authorities. The attorney general and others say that the board has the right to establish this rule and regulation, and it has been successfully practiced for the last four years, and if other State Boards of Health, who cannot secure legislative enactments regarding compulsory vaccination, will do likewise, we can soon control this matter.

It is unnecessary to argue the question of the necessity, as that has been so well set forth in the paper. We can add nothing to that phase of the subject; but the best method to bring this about is the subject for consideration by this Association. Try the Iowa method.

Dr. F. C. Curtis, of Albany, N. Y.—Doubtless every member of this Association knows well the name of Dr. Elisha Harris, and the intense interest he took in the subject of vaccination, as well as the attention he paid to it during his lifetime.

The paper refers to the use of humanized virus in contrast with animal virus. Among the inquiries directed by Dr. Harris relative to vaccination, was one of employing virus from the Jennerian Society, which, I understand, still exists as a branch of the London Society, in Providence, Rhode Island, the work of which is to transmit from one generation to another the virus obtained originally from the hands of Jenner. Dr. Harris undertook the use of some of this virus at one time, and I can only report what others have observed in connection with its use, namely, that it produces a clear and distinct lesion—that is, a well-defined, small-sized, regularly oval lesion, with a characteristic and clearly shaped crust, such as we consider ideal as a result of our vaccination work. The smallness and regularity of the lesion, the uniformity of its action, and the length of duration of the incubation period were quite in contrast with our common experience with the bovine virus, which is so generally used. My observation is that the human system takes to humanized virus more kindly than to the bovine, and if it could be assured from certain possible risks, and were obtainable in such unlimited profusion as the bovine, its use would be preferable.

Dr. J. Patterson, of Winnipeg, Manitoba.—In regard to compulsory vaccination, it is doubtful whether the courts of our civilized countries will sustain us in putting in force compulsory measures. Vaccination is a means of inflicting an artificial disease upon a human being. I do not think you can do this against his will. As to the manner in which we carry it out, we have a clause in our law by which we can take away from individuals the privileges which are offered to the public at large. For instance, we can prohibit unvaccinatetd children from going to school. Our school boards have

passed a regulation that all children going to the public schools must have a certificate of successful vaccination before they are admitted.

Dr. Adolph Gehrmann, of Chicago.—I wish to say a word or two in regard to bovine and humanized virus. As to the splendid results which Dr. Curtis describes as being due to humanized virus, similar ones can now be obtained with glycerinized lymph, which is prepared after the more recent method. The reason that we have had these unusual appearances from the typical Jennerian virus is from the fact that there were other bacteria present—that is, pus bacteria were present in the ordinary prepared vaccine points, which produced a suppurative inflammation in the area of the vaccination, besides the ordinary phenomena of the vaccination itself. By treatment with glycerine these bacteria can be destroyed in the course of forty days or more, and then we can get the typical lesion of Jenner "a pearl on the rose leaf." The vesicle is small and distinct in outline; the area about it is distinctly colored, and its final course is just as typical as with human virus.

Dr. C. H. Jones, of Baltimore, Md.—I wish to add a few words to the remarks of Dr. Gehrmann. In July last a couple of cases of small-pox appeared in the harbor, and the officers of my department were properly vaccinated. They developed such bad arms within forty-eight to seventy-two hours that it was thought to be due to the use of impure virus. I ordered an investigation made by our bacteriologist. A large number of vaccination points, tubes, etc., were examined, and in a number of points an enormous number of pus organisms were found, so that I determined to make some investigations with the new preparations. I found, as has been stated by Dr. Gehrmann, that we could obtain excellent results with glycerinated virus. The inflammation present in these cases was apparently due entirely to vaccine virus, and was confined to the immediate neighborhood where the lesion was made. The blebs produced were almost identical with those made by vaccine points that I used when a student in Edinburgh. We used human virus altogether, making our own preparations. It looks as if we have now in our hands a means by which we can do away with the antagonism on the part of a large number of the public.

Dr. Cressy L. Wilbur, of Lansing, Mich., chairman, presented the report of the Committee on Demography and Statistics in Their Sanitary Relation. (See p. 168.)

On motion of Dr. Gihon, the report was received and the committee continued.

Dr. José Ramirez, of Mexico, contributed a paper entitled, "Ought We to Reopen the Leper Asylums?" (See p. 180.)

Dr. H. M. Bracken, of Minneapolis, Minn., followed with a paper entitled, "Leprosy in Minnesota and the Northwest." (See p. 186.)

Dr. Henry B. Horlbeck, of Charleston, S. C., offered the following resolution:

Resolved, That the American Public Health Association call to the attention of the government of the United States the presence of leprosy in that country; that this Association urges upon the United States government the necessity of establishing a leper home or colony, where such persons can be segregated, similar to such as now exist in Canada and Mexico, and in this manner protect the general public, and at the same time afford these sufferers a proper home and medical care. (Referred to the Executive Committee.)

The papers and resolution were discussed as follows:

Dr. Henry B. Horlbeck, of Charleston, S. C.—Mr. President: The suggestions made in the last paper to the effect that some effort should be made by the Federal Government for establishing a home or colony where these unfortunates can be sent are very timely. I do not regard it as necessary to make it compulsory, but a well-established home of that kind would be a good thing, where lepers would not be individualized as persons harmful to themselves and others. I think it can be so arranged that these people would be delighted to go to such a home. We have in our State, from time to time, a few cases of leprosy, and yet the disease is not so far advanced that it is as contagious, as many other diseases. It seems to me, in Louisiana and the Southwest, some steps by the general government should be taken to care for these people. I believe such a home can be established and a Federal officer appointed to take charge of it. I know of a number of places that are suitable for such homes. There are islands on our coast from North Carolina to Florida that can be used for such purposes. For mlies and miles the air is almost perfect; the temperature is mild, and the fishing abundant, so that these people could have some pastime. I have no particular place to mention for the establishment of such a home, but I know of places that can be selected. While some steps should be taken in this matter, I do not know exactly in what manner this Association should recommend it. I think it is quite time that the question of leprosy should receive attention of a practical and definite nature, with a view to taking care of lepers in various parts of our country. I do not know to what extent they are a menace. In our State the disease has not developed to an extent to know whether it

is contagious or not. The Federal Government should see to it that these people are segregated, with a view of letting them enjoy what pleasures of life may come to them, so that they may not be ostracized in the communities in which they live.

Dr. C. P. Wilkinson, of New Orleans, La.—We have a number of lepers in Louisiana, largely restricted to a settlement of French descendants who have married and intermarried for many years and are all related. I do not know how many lepers there are in this colony, but it amounts to something like a hundred. The State of Louisiana has rented a tract of land and established a leper home, where they are all isolated and have no communication with anybody else. These people have become reconciled to this home, and do not want to live elsewhere. Admission to the home is not made compulsory, but it is clearly stated to them that they will have many advantages by going to this home that they do not have at other places. I believe in the course of time every leper in the State of Louisiana will be brought to this home. The tract of land is practically a farm; the lepers cultivate it, and make themselves almost self-supporting, so that it costs the State very little. I think Dr. Horlbeck's idea is a good one, and one which I heartily endorse. In selecting a tract of land as a home for these unfortunates, care should be taken to see that it is not surrounded by gnats and mosquitoes. Furthermore, a leper wants some occupation. Lepers should be segregated in places where they can engage in some profitable work, and this, I think, would be an ideal home for that class of people.

Mr. William F. Boardman, of Ottawa.—In connection with this discussion, I will say that the Dominion Government has established a lazaretto at Tracadie, New Brunswick, and the annual report is published in the Blue Book of the Department of Agriculture, from which I will read extracts from the report of Dr. A. C. Smith, inspector of leprosy:

"There are registered to-day twenty inmates of the lazaretto—sixteen males and four females. The youngest patient in the wards is eleven, and the eldest sixty-one years of age. Four of the patients are in the early stage of the disease; ten are somewhat more advanced, and six are far on in their sad journey towards the end of life. There were nine deaths—an unusually large number—due to so many having reached the final stage and succumbing, one after another, to a disease, relief from which can only be found through the portals of death. I may add that all who died had been attacked by la grippe last winter, and were, in consequence, enfeebled. At present we have very little suffering among the inmates. All, including the Icelandic

patients, seem surprisingly contented. The bright, sunny influence of the kind Sisters in charge accounts for the patient resignation which our poor lepers exhibit.

"Eight new cases were admitted. Of this number four came from Manitoba. The finding of four lepers among our Icelandic population caused some unnecessary alarm. These cases were not permitted by the government to remain long enough to become foci of the disease. Besides, leprosy is not a disease of modern civilization, and is seldom contracted by persons whose systems are well nourished. It is well known that members of leprous families living in poverty on the coast of Norway never develop leprosy after emigrating to the Western States of America. Leprosy is most prevalent in poverty-stricken areas. Poor and unsanitary conditions are factors of importance in the etiology of the disease; they favor the fecundation and development of the leprous poison. So far as I have noticed, our Icelandic people are cleanly, healthy and prosperous. Leprosy can never make headway among such in our country. Of course, lepers are not desirable citizens, and such as reach our shores should be sent back to the place whence they came. Whenever a leper is found in an advanced stage of the malady he should be isolated. The disease is insidious, and the consequences of a contact with a leper in the dangerous stage, by a person in any way predisposed to the disease, may appear only after many years. In the absence of law enforcing segregation, I had much difficulty in effecting the removal of one leprous individual living in squalid poverty at Pt. Marcell, N. B. The man was brought to the lazaretto, but not until after the dangerous stage had developed, and, probably as a consequence, his wife is now showing symptoms of leprosy. I seldom have difficulty in removing those affected. When, after careful examination, I declare a man to be leprous, his neighbors, and *those giving employment*, shun him, and he is glad to avail himself of the comforts of the lepers' home.

"During the year I gave certificates to several persons unjustly reported to be leprous, and in this way enabled them to return to employment.

"I have again to report that the institution is fulfilling its object—that of segregating those who might, through a careless indifference on the part of some with whom they would come in contact, become foci of the most horrible disease known to mankind."

Dr. Benjamin Lee, of Philadelphia.—Both of the papers to which we have listened have afforded additional confirmation of the fact which pretty much all investigations made of recent years into the question of the causation of leprosy have corroborated, namely, that

the disease is never inherited, but is always contracted. Its mode of communication is extremely obscure. The disease is very insidious; we do not know how long after exposure has taken place it may develop. In this fact lies its danger. But to my mind it stands apart from all other diseases with which sanitarians have to deal. The condition of the leper himself is one of such utter horror. He simply falls into ruin, ekeing out a miserable existence, dying a living death. We cannot justly use the numerical system in comparing leprosy with any other disease, because the conditions are so unspeakably horrible.

Isolation has been objected to by the author of the first paper; while segregation has been suggested by the author of the second. Unquestionably segregation is the true solution of this problem, and segregation I believe should not only be offered, but should, if necessary, be made compulsory.

The suggestion of Dr. Horlbeck, that the National Government is the proper authority to establish a home for lepers is an admirable one; but I had it in my mind that this Association had already made a suggestion to the National Government in that direction. I certainly recollect drawing up a resolution of that kind myself, and if it was not sent by this body, it was sent by the National Conference of State Boards of Health to the National Government. It appears to me, however, that it would be entirely appropriate for this Association to adopt a recommendation of that kind and transmit it not only to the United States Government, but to the other Governments represented in this Association.

Dr. James H. Burroughs, of Asheville, N. C.—If we are going to have a Federal Hospital or home established for lepers, what we need to do is to memorialize Congress to that effect, and I doubt the propriety of that. I think it is better to leave the matter entirely in the hands of State Boards of Health. Let each State have its special home or colony for its lepers, and it will be easier to keep them in those homes or on those farms than if we had one home or one farm for the whole lepers of the nation. I am in favor of leaving the matter where it is, and let each individual State Board of Health decide as to the best course to be pursued.

Dr. J. I. Gibson, of Denison, Iowa.—As the State of Iowa has been mentioned in connection with leprosy by Dr. Bracken, I will say that our State Board of Health knows of two cases of the disease in the State. They are Norwegians, and are under the care of the local boards of health.

Dr. James Patterson, of Winnipeg, Manitoba.—So far as leprosy in Manitoba is known to exist, I will say that all lepers are taken care

of by the Dominion Government at two points, and are not cared for by Provincial or State Legislatures. I think it would be a great mistake to have institutions for the segregation of lepers scattered all over the United States of America, as there would be such a small number of applicants for admission to each of such homes or colonies. It seems to me, segregation is the only method to be pursued in dealing with these unfortunates, and it has the effect of reducing the number of cases in this country. There has been no spread of the disease, as far as can be ascertained, from cases that were taken and placed in the lazaretto at Tracadie, and the number of cases in Canada is steadily decreasing. Many of the lepers at the Tracadie lazaretto did not contract the disease in this country; they were Icelanders, and contracted it at home, where isolation is not enforced. Leprosy is an infectious disease, and should be treated as such by isolation of those affected.

Dr. C. H. Jones, of Baltimore.—I rise to heartily second the idea of asking the United States Government to establish a home or colony for lepers, for the reason that individual States could not possibly undertake the work. So far as I know, there is only one case of leprosy in Maryland, and this happens to be in Baltimore. We hardly know what to do in this case. We could not put the case in the poor house very well, and yet the patient would be a great expense to the city and state if not placed there. The National Government should take charge of these cases.

Dr. Samuel H. Durgin, of Boston.—I heartily endorse the plan proposed. A leper in any community is dreaded, and the lack of facilities for properly taking care of them is so great that the cases are scattered and hidden. Physicians rarely report them, and families are tabooed in society where a case of leprosy is known to exist. In every State I know of, we will find no place for these persons. They are either sent to the State almshouse, where they do not want to go, or are taken in charge by the local health authorities, and at great expense. I have had one case under my care which has lasted nearly three years at an expense of about fifteen dollars per week to the city of Boston. He must be kept by himself, with a nurse, and the paraphernalia used is that required for running a hospital for a larger number. It is a burden to take care of one of these cases separately, while it would be a trifling expense to the Federal Government, with a reservation suitable for the comfort and proper care of all the cases. I hope this suggestion will be endorsed, and the Government be urged to adopt it.

Mr. Crosby Gray, of Pittsburgh.—I heartily favor the resolution offered by Dr. Horlbeck, the proposition being that the General Government should do something toward the segregation of lepers.

Pittsburgh has been indulging in a little experience with a leper during the past year and a half.

A native Pittsburgher, who has been a roamer for many years, traveling all over the world almost, is believed to have contracted leprosy in the vicinity of Para, Brazil, about nineteen years ago. He continued his travels and finally returned to Pittsburgh sick and suffering from he did not know what at the time. He was seen by several physicians, who were unable to determine what the trouble was. When he was admitted to one of our city hospitals, his case was diagnosed as leprosy. He was surreptitiously removed from the hospital, and was driven from pillar to post, as the saying is, spending a portion of his time with one set of relatives until they tired of him, and then a time with some other.

He was a married man, had one child and was very poor, so that it became necessary for his family to separate, the wife and child being now, I believe, in the State of Ohio. He was taken care of by relatives, who were also in rather poor circumstances, for some time. Finally it became noised abroad that such a case existed in the locality, and his relatives cast about to find some means of disposing of him. They appealed to the Bureau of Health, and, after consideration, it was concluded that the proper thing to do was to isolate him in a hospital. We have him in a separate building on our hospital grounds, where he has been for probably a year and a half. He is an expensive luxury, if it may be so termed. It costs us $2.50 per day for nurse hire, in addition to maintenance. He is in a hopeless condition, and is a typical case of leprosy. He has lost one or two fingers, one or two toes, and has the peculiar characteristic facial appearance of a leper. He is almost totally blind, his hair is falling out, and he is really in a pitiable condition. He has suffered from the disease for about fourteen years, and of course we can only surmise how long he may live. He is a burden to the city, as he was to his friends. We are of the opinion in Pittsburgh that some other disposition should be made of him. Our State Board of Health is unable to make provision for such cases, and it does seem to me that the proper thing to do is for the General Government to make such provision by establishing a colony or home where this and other unfortunates can be properly cared for.

I hope the Association will adopt the proposition submitted by Dr. Horlbeck, and that an earnest effort will be made to induce the General Government to establish such a colony or home as is suggested.

Dr. George H. Rohé, of Sykesville, Md. I think the Association is to be congratulated upon the moderate tone and character of the recommendations made in the two papers that have been presented upon this subject. There has been so much sanitary shrieking, so to speak, upon the subject of leprosy, not only in the daily press, but in sanitary publications, that it is refreshing to hear Dr. Bracken and the gentleman from Mexico present such instructive papers, in which there is no manifestation of hysterics. So far as my personal observation is concerned, and I have had something to do with cases of leprosy, I would just as soon treat them in general hospitals as a good many other diseases, as, for instance, syphilis. But we all know the popular prejudice against leprosy, the fear that it is extremely contagious, which the reports of this disease everywhere in this country have proven to be exaggerated. It seems to me prudent to endorse entirely not only the proposition for the establishment of a home for lepers, where they can be segregated, provided they are not removed compulsorily, but also to endorse the conclusions that have been drawn, that leprosy is by no means such a dangerous disease to the public health as it is generally believed to be.

Mr. J. W. Hughes, of Montreal, read the "Report of the Committee on Sanitation, with Special Reference to Drainage, Plumbing and Ventilation of Public and Private Buildings." (See p. 192.)

Adjourned until 3 P. M.

THIRD DAY—AFTERNOON SESSION.

The Association reassembled at 3 P. M., and was called to order by the First Vice President, Dr. Lee.

The first thing in order was a discussion on Mr. Hughes' report, read at the morning session.

DISCUSSION ON THE REPORT OF MR. HUGHES.

Dr. Samuel H. Durgin, of Boston. Mr. President: I venture to interject a few remarks here concerning gas fitting in connection with plumbing, and to draw the attention of the Association to the fact that we have neglected the more serious danger in our great energy over the lesser. Bad gas fitting is more dangerous to health than bad plumbing. The object of this brief paper is to invite attention to a comparison of the two dangers. (Dr. Durgin then read a short paper. (See p. 196.)

Dr. Charles V. Chapin, of Providence, R. I.—I would like to ask Dr. Durgin whether any of the deaths were due to illuminating gas; whether they were caused from a leak in the pipe, or whether it was always from failure to turn the cock properly?

Dr. Durgin.—In the majority of cases it is the result of either design or accident in leaving the cocks open. In many instances the cocks have been incompletely turned off, by ignorance or accident, and the escape of the gas has been unintentional.

Dr. Charles V. Chapin, of Providence, R. I.—I was very much interested in Dr. Durgin's paper, and am glad that he has called attention to this source of pollution of the air of our houses, which I think is more important than defective plumbing. I think most of us have been annoyed by it several times, and it seems to me that here is a legitimate field for municipal interference. There is one great offender that Dr. Durgin did not speak of in his paper, and that is the gas companies. The companies are very careless and neglectful of leaks in the street mains—at least, that has been so in my own city—and any efforts that are made to control the gas piping should be directed against the gas companies as well as the gasfitters, compelling them to put in the best possible form of distributing pipes and to repair the leaks with the greatest possible dispatch. When leaks occur in the winter and the ground is covered with snow, the gas companies waste a good deal of time rather than pursue energetic measures to get at the pipes and stop the leaks. In such cases I have known the gas to enter private houses in such great quantity as to render them uninhabitable.

Dr. Albert L. Gihon, U. S. Navy.—I would like to ask Mr. Hughes if he believes that gas leakage can ever be attributed to pin holes in old gas pipes, concealed between floors and ceilings or inside of the walls?

Mr. J. W. Hughes, of Montreal.—I will say, in reply to Dr. Gihon's question, that during an experience extending over thirty years, I have yet to find a house with iron pipes in which I could say that the leakage of gas was due to perforation of the pipes. Usually leaks are caused by settlement where iron gas pipes are used, and the most prolific leaks are due to imperfect gas pipe fixtures. I do not know what the practice is in other cities or towns, but in Montreal the practice is to test buildings when the gas is piped, and as a rule in my business we have very little trouble in finding leaks in the pipes. But we are frequently called upon to find leaks in the fixtures. That is very much the case in conection with gas-stove fixtures; the taps are used perhaps ten times a day for turning on and off the fires, and quite often there is leakage.

Dr. Gihon.—It is a common explanation in New York to attribute leakage to old pipes between the rooms, instead of to the fixtures.

This is done probably with a view of having the old pipes removed and new ones put in.

Dr. Durgin.—Do you mean gas pipes?

Dr. Gihon.—Yes. It is a common explanation for local plumbers to say that it is necessary, when a leakage is found, to remove the pipes which are twenty or thirty years old, and put in new ones. I am glad to know from Mr. Hughes that perforation of the pipes is not the cause of the leakage.

Dr. W. C. Woodward, of Washington, D. C.—I have had occasion recently to consider the subject of the intercepting trap. I think its omission would be a dangerous innovation, one which should not be tolerated until further evidence is secured to sustain it. It is all very well for the benefit of the public sewers, to say we should omit such traps, but I do not think it is the proper thing to ask one citizen or a few citizens to ventilate the public sewers, unless we can go back over old houses and have all existing intercepting traps removed.

Another serious problem is this, especially in the southern section of the United States: The water seal in the ordinary traps on fixtures throughout the house will evaporate promptly, so that during the period when the house is usually closed, that is, during the summer months, the water seal of the fixtures disappears, and the public sewers would be, if the running trap were removed, ventilated into every private residence so situated. This is a very undesirable condition. The claim is made that the running trap interferes with the flow of sewage; that may be true. If so, it is a matter to be corrected by making changes in the pipes and improving the form of the intercepting traps. The common intercepting trap is made with too short a turn. The traps pictured in the English works have not such a sharp turn, and the flow of sewage is not interfered with. Another objection to the omission of these traps would manifest itself in removing fixtures for the purpose of either placing new ones or of correcting defects in those already in place. It may be a trivial matter to admit into a house an amount of sewer gas that would enter during the period while the fixtures were disconnected, but nevertheless it is a subject to be carefully considered, that during that period the entire public sewer would be ventilated directly into the house. I think that the omission of the intercepting trap would be a dangerous innovation, and one that should not be lightly entered upon.

Dr. Samuel H. Durgin, of Boston.—I think it can be shown that the disconnecting trap is a greater evil than good. It is not hard to see that the moment you make this seal on your drain pipe you have behind it a stagnant, dirty condition all the way to the fixtures of

your house and to the top of the extended soil pipe. The best way to keep a clean soil or drain pipe or sewer is to admit free currents of air. If there is an opportunity for the currents, they will escape above the house into the free fresh air, where they can do no one any harm, or give any annoyance, provided the soil pipe is extended above the windows of their neighbors.

Dr. Henry Mitchell, of Asbury Park, N. J.—It is a source of satisfaction that during the last few years there has been considerable abatement in the agitation concerning the claims of the plumber to pre-eminence among tradesmen in his relations to the public health. We must admit that sanitarians have been slow in brushing aside the cobweb of commercialism which has promoted much of the "sanitary plumbing" fad which has in recent years been spread over newspapers and advertising boards. But I wish to support the views just expressed by previous speakers, that the trap in the main drain is the house-owner's rightful defense against entrance into his dwelling of sewer air. We all have had opportunity to learn that it is extremely difficult to obtain the construction of an air-tight system of house drainage, and a sufficient reason for requiring the use of the trap on the main drain is the disinclination to admit into our dwellings the air from our neighbor's drains. It is bad enough to know that we have admitted to our living apartments air from our own drain, without also breathing the air of the sewer. The fresh-air inlet on the house side of the trap on the main drain serves to dilute the air of the drain pipes of the dwellings, and a constant current of fresh air is flowing up through the house drain and its branches to the exit at the roof; but if no such intercepting trap is provided, then the house drain is an open way from sewer to house top, with no chance for the introduction of fresh air, and with many chances for the escape of sewer air through the defects in the pipe line into bedrooms and other portions of the dwelling.

I fully agree with the views of Dr. Durgin, that the gasfitter needs attention at the hands of the sanitary inspector, for while there may be difficulty in showing that sewer air produces sickness, there is no doubt that illuminating gas is an unhealthful addition to the air of dwellings, and it is most interesting to learn that leakage of gas is almost invariably occurring in the case of dwellings which are connected with the gas mains.

On general principles, we stand for uncontaminated air—pure air—and it is to be hoped that in the course of time the courts will rule that everything which pollutes or vitiates the air of built-up districts

is a nuisance, whether it is defective plumbing and gasfitting, fat rendering, black smoke or other cause or condition.

Dr. F. X. Valade, of Ottawa, read a paper entitled "The Administration of the Adulteration Act in Canada." (See p. 199.)

Dr. Juan Brena, of Zacatecas, Mexico, read a paper entitled "Rough Notes on the Etiology of Typhus Fever." (See p. 206.)

On motion of Dr. Horlbeck, the discussion on this paper was deferred for the present.

Professor S. H. Woodbridge, of Boston, contributed an elaborate paper entitled "Heating and Ventilation of Railway Coaches," which was read by Dr. Hurty, in the absence of the author. (See p. 218.)

On motion of Dr. Gihon, the paper was ordered to be published in the Transactions in full, with the accompanying diagrams; also the illustrations from the lantern, if practicable.

On motion of Dr. Horlbeck, discussion on the report was postponed on account of lack of time.

Dr. Gregorio Mendizabal, of Mexico, read a paper on "Diseases of the Skin and of the Hairy Scalp Which Are Commonly Transmitted by Contagion at Schools: Ways and Means of Prevention." (See p. 234.)

Professor Franklin C. Robinson, of Brunswick, Maine, chairman, presented a "Report of the Committee on Disinfection and Disinfectants; Conditions of Greatest Efficiency of Some Common Disinfectants." (See p. 237.)

Dr. Wyatt Johnston, of Montreal, followed with remarks on "Methods of Testing Disinfectants."

Dr. Adolph Gehrmann, of Chicago, presented a short paper on "Methods of Using Disinfectants in Cities."

Dr. Frederick Montizambert, of Montreal, followed with "Remarks on Disinfectants in Quarantine Work."

FOURTH DAY—MORNING SESSION.

The Association met at 10 A. M., and was called to order by the President.

After announcements by the chairman of the local Committee of Arrangements, the President called for the report of the Executive Committee.

The Secretary.—In regard to the establishment of a home or colony for lepers, the resolution offered by Dr. Horlbeck was amended by the Executive Committee, and it reports back to the Association

with the recommendation that it be adopted. The resolution, as amended, is as follows:

Resolved, That the American Public Health Association call to the attention of the government of the United States the presence of leprosy in that country. This Association would urge upon the United States government the necessity of establishing a leper home or colony, similar to such institutions as now exist in Canada and Mexico, where such persons can be segregated, and in this manner protect the general public and at the same time afford these sufferers a proper home and medical care.

THE PRESIDENT.—You have heard the resolution. Are there any remarks upon it?

DR. DURGIN.—I move its adoption. Seconded and carried.

THE SECRETARY.—The following resolution has been recommended by the Executive Committee:

Resolved, That a Committee on Laboratory Work and Methods be appointed by the chair, with instructions to secure, as far as possible, co-operation between our sanitary laboratories and the reporting to this Association of progress in laboratory work.

On motion, the resolution was adopted.

THE SECRETARY.—The following resolution is recommended for adoption:

Resolved, That the Committee on Public Health Legislation be continued; that it be authorized and requested to proceed on the lines of work already begun; that the Association reaffirms its endorsement of the creation of a National Department of Public Health for the United States.

THE PRESIDENT.—You have heard the recommendation of the Executive Committee. What will you do with it?

DR. GIHON.—I move that it be concurred in, and the resolution adopted. Seconded and carried.

THE SECRETARY.—The Executive Committee recommends the adoption of the resolution offered by Dr. Frank W. Wright. (See p. 338.)

On motion, the recommendation of the Executive Committee was concurred in.

DR. LISTON H. MONTGOMERY, of Chicago.—I think it would be well, Mr. President, for the resolutions pertaining to the establishment of a leper hospital or home to be forwarded to members of

Congress or the President of the United States; also the resolution with reference to the establishment of a National Department of Public Health. I move, therefore, that copies of these resolutions be sent to the President of the United States. (Motion not seconded.)

The Auditing Committee, through Dr. Watson, as its chairman, reported as follows:

Your auditing committee beg leave to report that they have examined the accounts of Henry D. Holton, Treasurer, and have found them correct.

The books are kept in a very satisfactory manner.

IRVING A. WATSON,
PETER H. BRYCE,
FRANK W. WRIGHT,
Auditors.

September 29, 1898.

On motion of Dr. Horlbeck, the report was adopted.

THE PRESIDENT.—You will now give your attention to the report of the Advisory Council.

Mr. Crosby Gray, the Secretary of the Advisory Council, read the report, as follows:

REPORT OF THE ADVISORY COUNCIL.

OTTAWA, September 29, 1898.

To the President and Members of the American Public Health Association;

GENTLEMEN—Your Advisory Council begs to report that it has performed the duties required of it by the Constitution, and respectfully submits the following nominations for the various offices of the Association for the ensuing term, viz.:

For President—Dr. George H. Rohé, of Sykesville, Md.

First Vice-President—Dr. Henry Mitchell, of Asbury Park, N. J.

Second Vice-President—Dr. Jésus E. Monjaras, of San Luis Potosi, Mexico.

Secretary—Dr. Charles O. Probst, of Columbus, Ohio.

Treasurer—Dr. Henry D. Holton, of Brattleboro, Vt.

For Members of the Executive Committee—Professor F. C. Robinson, Brunswick, Me.; Dr. Gregorio Mendizabal, Orizaba, Mex.; Dr. Peter H. Bryce, Toronto, Ont.; Dr. H. M. Bracken, Minneapolis, Minn.; Dr. Irving A. Watson, Concord, N. H., and Dr. Frank W. Wright, of New Haven, Conn.

Your Advisory Council recommends the city of Minneapolis as the place for holding the next annual meeting of the Association, and begs to suggest to the Executive Committee that said meeting be held early in the month of November.

Respectfully submitted,

CROSBY GRAY, Secretary.

DR. GIHON.—I move that the Secretary be authorized to cast the ballot of the Association in the affirmative for the gentlemen named. Carried.

This the Secretary did, and they were declared elected.

DR. GIHON.—Mr. President, one of our oldest members, a man who was never absent when he could possibly be with us, is now stricken with disease. He has been one of our most influential members, and I move that the Secretary of the Association be instructed to send him a telegram expressing the regret of the Association that he is not here, and our wishes for his recovery and comfort. I refer to Dr. James F. Hibbard, of Richmond, Indiana. Carried.

The President announced the Commissions on Revision of Classification of Diseases:

For the United States—Dr. S. W. Abbott, Massachusetts; Dr. C. L. Wilbur, Michigan; Dr. A. G. Young, Maine.

For Canada—Dr. Peter H. Bryce, Ontario; Dr. E. P. Lachappelle, Quebec; Dr. E. Pelletier, Quebec.

For Mexico—Dr. Eduardo Licéaga, Mexico; Dr. José Ramirez, Mexico; Dr. Jésus E. Monjaras, Mexico.

(To be confirmed by Executive Committee.)

Committee on Definition of Epidemic—Dr. U. O. B. Wingate, Wisconsin; Dr. Benjamin Lee, Pennsylvania; Dr. Charles V. Chapin, Rhode Island; Dr. Frederick Montizambert, Quebec; Dr. George H. Rohé, Maryland.

Committee on Publication of a Periodical Instead of Annual Volume—Dr. George H. Rohé, Maryland; Dr. Charles O. Probst, Ohio; Dr. Henry D. Holton, Vermont; Dr. Irving A. Watson, New Hampshire; Dr. F. W. Wright, Connecticut.

Committee on Laboratory Work and Methods—Dr. Wyatt Johnston, with power to add associates.

Committee on National Leper Home—Dr. H. M. Bracken, Minnesota; Dr. Henry B. Horlbeck, South Carolina; Dr. José Ramirez, Mexico; Dr. C. P. Wilkinson, Louisiana; Dr. George E. Coulthard, New Brunswick.

Dr. José Ramirez, of Mexico, read a paper on "Diptera From a Hygienic Point of View." (See p. 257.)

Dr. M. A. Veeder, of Lyons, N. Y., read a paper entitled "The Spread of Typhoid Fever and Dysenteric Diseases by Flies." (See p. 261.)

DISCUSSION ON THE PAPERS OF DRS. RAMIREZ AND VEEDER.

Dr. Gardner T. Swarts, of Providence, R. I.—The subject of contamination of food by flies is a very interesting and fascinating one, and there is no doubt that flies play a prominent part in the spread of diseases. But I think we are liable to be led too far in our enthusiasm if we take the deductions from experiences of the army which have been cited in the consideration of this subject. Either one thing or the other is wrong. It has been stated that the food has been infected in our army, possibly in Cuba, where, by means of flies, the typhoid bacillus has gained access and caused the disease. We are informed, on the other hand, by those who have investigated the subject, that not only did the soldiers not have enough to eat, but that the food was not properly cooked, and that there was not enough on hand to be contaminated. The flies may have carried organisms of various kinds to the food, and there is no doubt that typhoid fever and other diseases may have been propagated in this way, by carrying diseased material to the cooked food. I think, however, before we jump to conclusions in considering a subject of this kind, it would be good policy for us to obtain several practical demonstrations in bacteriological work.

As to whether dissipation of the soldiers had much to do with the sickness in the army at Chickamauga, I will say that a surgeon who was on the ground states (in the *Journal of the American Medical Association*) that, in looking out of his bedroom window at two different places, he saw seventeen soldiers lying in the street in an intoxicated condition, and there was not that military control over the men that might have been expected. Contamination and sickness may have been caused in this way, and it should not be lost sight of in our eagerness to seize upon a new theory. Let us not forget our false teachings in regard to sewer gas as a factor in producing specific diseases.

Dr. J. N. Hurty, of Indianapolis, Ind.—In connection with the papers that have been read, I will say that last year in the town of Tipton, Indiana, a place of about four thousand inhabitants, there was an outbreak of dysentery, which resulted in about thirty deaths, and how many cases I do not know. But subsequent investigation showed that a poor family had moved in there, and a few days after their arrival a child had died of dysentery. They had thrown the

dejecta into the back yard on the ground. The first case appeared shortly after in the immediate neighborhood, and from it the disease spread, the circle gradually getting wider and wider. The dysentery evidently was not propagated by water carriage. It could not have been. It must have been propagated by flies, and this hypothesis is further strengthened by the fact that, at that time, for some unknown reason, there was an unusual plague of flies. So I think I am warranted in saying that this epidemic of dysentery was propagated by flies, and ever since then I have had my eyes open for the same conditions, but nothing so pronounced as that has appeared.

The next thing in order was the "Report of the Committee on Transportation of Diseased Tissues by Mail." In the absence of the Chairman, Dr. E. P. Lachapelle, the report was read by the Secretary. (See p. 263.)

On motion of Dr. Gihon, the report of the committee was accepted, and the committee discontinued.

When the President called for the "Report of the Committee to Consider and Report upon some Method of International Arrangement for Protection against the Transmission of Infectious Diseases," Dr. Gihon arose and said: "Through some inadvertence, Dr. Stephen Smith's name was left off of this committee and Dr. Montizambert was made Chairman. Dr. Montizambert explains that this is a matter which chiefly concerns the United States, and as it involves communication with the President of the United States, as contemplated in the terms of the organization of the committee, it is a manifest impropriety for any Canadian member to be made Chairman of it. He remarks also that a Canadian could hardly address the President of the United States with reference to matters of legislation, and he therefore suggests that the name of Dr. Stephen Smith be restored as Chairman of the committee. I therefore move that the committee of which Dr. Montizambert is a member be reconstituted and Dr. Stephen Smith made Chairman. Carried.

Dr. D. E. Salmon, Chairman, read the "Report of the Committee on Animal Diseases and Animal Food." (See p. 265.)

Dr. Charles N. Hewitt, of Red Wing, Minn., contributed the "Report of the Committee on the Duties and Responsibilities of the Healthy Man for his own and Other's Health," which was read by Dr. Gihon in the absence of the author. (See p. 270.)

On motion, this committee was discharged.

Dr. Wingate, of Milwaukee, Chairman, presented the report on "Public Health Legislation." (See p. 300.)

Dr. Benjamin Lee, of Philadelphia, read a paper entitled "An Epidemic of Diphtheria Traced to an Infected Milk Supply." (See p. 281).

Dr. Eduardo Licéaga, of Mexico, contributed a paper on "Preventive Antirabic Inoculation Service in Mexico." (See p. 286.)

Dr. E. A. de Schweinitz, of Washington, D. C., read a "Report of Some of the Most Important Papers Presented at the Fourth Congress of Tuberculosis, Held in Paris, July 27th—August 4th, 1898." (See p. 287.)

Dr. A. M. Rosebrugh, of Toronto, followed with a paper on "The Treatment of Inebriates." (See p. 291.)

Dr. M. A. Veeder, of Lyons, N. Y., read a paper on "Garbage Reduction by Steam." (See p. 296.)

Dr. Gardner T. Swarts, of Providence, R. I.—I would like to ask Dr. Veeder if this system which he describes is in operation anywhere?

Dr. Charles O. Probst, of Columbus, Ohio.—I should like to know wherein this differs from the Chamberlain garbage plant which has been put in in one or two places?

Dr. Veeder.—I am not very familiar with the Chamberlain garbage process. I have found it difficult to get access to some of the plants, and have not had an opportunity of seeing all of them. I intended to go to Detroit to see the process in use there. So far as I know, fractional distillation and immediate filtration of garbage itself, all being under the control of vacuum, is substantially new. And so are most of the processes involved in drawing off the material and reheating. Here it all goes through one process. It is all finished when it comes out.

Dr. Probst.—I think it is very much like the Chamberlain process that is used in Columbus, Ohio, and has not been found entirely satisfactory. Injunctions have been issued against the company on the ground of the process creating a local nuisance and bad odors. However, a rehearing is to be had on that question.

Mr. Rudolph Hering, of New York City.—You may remember the report of the committee submitted last year which stated that the question of garbage disposal should be considered from two aspects, the sanitary and the economical. If a process is perfect in a sanitary way and costs a great deal more money than some other process which will accomplish the same sanitary object at a less expense, the system will fail in its adoption. It seems to me, so far as I can see from an engineering point of view, that this system is not an eco-

nomical one, while its success from a sanitary standpoint might be perfect. But in order to obtain this success, a greater expenditure is no doubt required than that which would allow of the destruction of the same amount of garbage by cremation.

The report of the committee made statements based on a large number of statistics collected from Europe, the United States and Canada, which very clearly indicated that for small communities or small cities cremation of garbage seemed to be the only method which was economical and sanitary at the same time. There was a doubt in our minds in the case of large cities, where a large establishment could be built, requiring a large capital, and convert the garbage into certain saleable products. It is generally less expensive to do certain things on a large scale than on a small one, and the reduction processes have probably for this reason failed one after another in our country in the smaller cities. They are now confined only to the larger ones, and they are spreading somewhat. For instance, in the last year the city of Boston has adopted the reduction process. Our experience in New York, which has the largest reduction works in the world, is not yet satisfactory. Within the last few months there has been a great deal of complaint on account of the nuisance created at these works. Dr. Jenkins and others have recently reported upon this system and recommended further improvements so as to prevent the unsanitary conditions and odors coming from the garbage, both before it is subjected to treatment and also during certain stages of the treatment. This has been the history of nearly all reduction works in the United States—St. Louis, Milwaukee, Cincinnati, New Orleans, etc. The nuisance can be avoided if enough money is spent, but if a process thereby is no longer profitable the owners do not want to continue it.

Such in brief is the present status of the garbage question. It is not probable from an engineering point of view that a garbage reduction plant will be profitable on a small scale, as compared with the destruction by fire, the method universally adopted in Europe, and to which no serious objection has been raised.

The reason why the system of cremation has not been more successful in our country seems to your committee to lie in the fact that the furnaces were not properly constructed. The question of mechanical engineering has apparently not received enough consideration. During the last few years Hamburg has had large garbage cremation works in operation and there has been no trouble whatever in the way of preventing offensive odors, and the destruction is economical.

It appeared to your committee that the question would probably be solved in a similar way in our country; at the same time, there was a clear indication that garbage might yield a profit under certain circumstances, namely, when the works are very large and can be conducted on a business basis, and where they would not be under a very strict supervision of a board of health, so that now and then nuisances might be committed without objection.

Dr. Gihon.—Since our last annual meeting, the Association has suffered the loss of one of its foundation members, and a former Treasurer, Dr. J. Berrien Lindsley, of Nashville. I move that Dr. Henry Mitchell be appointed as a committee of one to prepare an appropriate memoriam to be incorporated in our Transactions, expressing the regret of the Association at the loss of Dr. Lindsley. Carried.

Dr. Samuel H. Durgin.—I wish to make a motion to reconsider the vote of yesterday concerning the resolution offered by Dr. Suiter in connection with the paper of Dr. Wende. I make this motion for the purpose of enabling Dr. Suiter to introduce a resolution which he has amended. Carried.

Dr. A. Walter Suiter.—I wish to offer as a substitute a resolution to take the place of the one presented by me at a previous session, and which is supplementary to the report of the Committee on Infant Mortality. It is this:

Resolved, That this Association recommends that public health authorities in general exercise every possible means to effect the complete discontinuance of the use of the so-called long tube nursing bottle, which is so largely a contributing factor in infant mortality.

Dr. Durgin.—I move that this resolution be substituted for the other.

Dr. Henry Mithell.—I am in favor of the adoption of this substitute, for the reason that there seems to have been a misconception on the part of members of this Association regarding this question. In truth, the resolution of yesterday was not recommended for adoption by the Executive Committee because it regarded this subject as settled long ago, and because it did not seem necessary to take it up again or at this time, and in order to prevent any such misunderstanding I am in favor of the adoption of this substitute.

The President put the motion to adopt, and it was carried.

The President.—I omitted one committee, namely, the Local Committee of Arrangements. I therefore appoint Dr. R. O. Beard, of Minneapolis, Chairman of the Local Committee of Arrangements.

Dr. Gihon offered the following resolution:

Resolved, That the thanks of the American Public Health Association be extended to the Hon. Sydney Fisher, Minister of Agriculture; to the Local Chairman of the Committee of Arrangements, Dr. Sweetland; to Mrs. Perley and Ladies' Committee; to the Chairman of the Reception and Entertainment Committees; to Judge MacTavish; to the Chairman of the Municipal Committee, Alderman Black; to the Chairman of the Printing and Badge Committee, Mr. C. H. Keifer; to the Honorable Secretary Thomas MacFarlane; to His Worship the Mayor of Ottawa; to the Acting Mayor, Alderman Cluff, and to the Chairman of the Membership Committee, Dr. H. B. Small, for kindness and courtesies extended to the members and guests of this Association.

Resolved, further, That the thanks of the Association be extended to the railroads for granting reduced rates, and to the gentlemen of the press, who have continually attended and reported the proceedings of our Association. Seconded and unanimously carried.

Drs. Gihon and Durgin were appointed to escort the President-elect, Dr. Rohé, to the chair.

The retiring President, Dr. Lindsley, in presenting Dr. Rohé, said: I have the pleasure as well as honor of presenting to you one who has long been connected with the Association and has been an active participant in its work. He is known to all of you, and therefore needs no introduction from me. It is unnecessary for me to speak of his fitness for the position, for I found yesterday, when Dr. Gihon presented his name, that we could not exaggerate his fitness for the place. He simply told the truth. Gentlemen, I present to you Dr. Rohé.

Dr. Rohé was warmly received. He said: Mr. President, and Gentlemen: It is a great privilege to preside over the deliberations of a body of sanitarians representing the three great Republics of North America. (Applause.) I assure you that I deeply appreciate the honor of being called to this position. I confess, that I do not know of any reason why you should have elected me to this high office. I have been told by Dr. Gihon that there were some reasons, but no very clear account has been given me of what those reasons were. However, no matter what reason is given for having conferred this distinguished honor upon me, I feel that I cannot express in words my profound thanks and gratitude for your generous action. I will defer a more formal expression of my sentiments until next year. In the meantime, I will ask every member of the Association to recollect that while we are in the twenty-sixth year of our existence, it has done much to advance sanitary science in the three great commonwealths, and that probably what it has accom-

plished on this continent has had some influence in other countries. Still there is more work to do; perhaps there is harder work to do, and the officers of this Association are simply a small part of the working force of this great body. You constitute the working force of the Association, and unless you assist the officers in their work the year will be barren of results. It will depend upon you to uphold the officers in their administration and to do that work which will advance sanitary science during the coming year. I shall expect every member to do his duty. If he does not know exactly what his duty is in the matter, if he will write to the Secretary of President he will get a gentle reminder.

The next meeting of the Association, as you all know, will be held in one of the large and progressive cities of the Northwest. The attendance at this meeting has been large; I hope at the next meeting it will be three or four times as large as it has been at this. While the work of the Association at this meeting has been perhaps better throughout than at any other meeting, I hope it will be eclipsed at the meeting next year. If at the close of the year the anticipations which I have formed are realized, I think the American Public Health Association may congratulate itself upon the addition of another year of usefulness. I have nothing further to say other than to again express my profound gratitude for the honor which you have conferred upon me. (Loud applause.)

Dr. Durgin.—I move that a vote of thanks be extended to our retiring President for the pleasant and efficient manner in which he has presided over the deliberations of this meeting. Seconded and unanimously carried.

Dr. Lindsley, in a few well-chosen words, thanked the Association for the unexpected compliment, and said that he could not have presided over the meeting unless he had received the hearty coöperation of the members. He appreciated very highly the compliment.

There being no further business to come before the Association, on motion, it adjourned, to meet in Minneapolis, Minnesota, in 1899.

CONSTITUTION

OF THE

AMERICAN PUBLIC HEALTH ASSOCIATION.

TITLE.

I. This Association shall be called "THE AMERICAN PUBLIC HEALTH ASSOCIATION."

OBJECTS.

II. The objects of this Association shall be the advancement of sanitary science, and the promotion of organizations and the measures for the practical application of public hygiene.

MEMBERS.

III. The members of this Association shall be known as Active and Associate. The Executive Committee shall determine for which class a candidate shall be proposed. The *Active* members shall constitute the permanent body of the Association, subject to the provisions of the constitution as to continuance in membership. They shall be selected with special reference to their acknowledged interest in, or devotion to, sanitary studies and allied science, and to the practical application of the same. The *Associate* members shall be elected with special reference to their general interest only in sanitary science, and shall have all the privileges and publications of the Association, but shall not be entitled to vote.

Delegates from national, state, provincial, and municipal boards of health, organized sanitary associations, and the army, navy, and marine hospital service, shall be entitled to be enrolled as active members upon presentation of their credentials to the Executive Committee. Members, not delegates from such bodies, shall be elected as follows:

Each candidate for admission shall first be proposed to the Executive Committee, in writing (which may be done at any time), with a statement of the business or profession and special qualifications of the person so proposed. On recommendation of a majority of the commitee, and on receiving a vote of two-thirds of the members present at the regular meeting, the candidate shall be declared duly elected a member of the Association. The annual fee of membership in either class shall be five dollars.

IV. The officers shall be a President, a First and a Second Vice-President, a Secretary, and a Treasurer.

All the officers shall be elected by ballot, annually, except the Secretary, who shall be elected for a term of three years.

PRESIDING OFFICER.

V. The President, or in his absence one of the Vice-Presidents, or in their absence a chairman *pro tempore*, shall preside at all meetings of the Association. He shall preserve order, and shall decide all questions of order, subject to appeal to the Association. He shall also appoint all committees authorized by the Association, unless otherwise specially ordered.

SECRETARY.

VI. The Secretary shall have charge of the correspondence and records of the Association; and he shall also perform the duties of Librarian. He, together with the presiding officer, shall certify all acts of the Association. He shall, under the direction of the Executive Committee, give due notice of the time and place of all meetings of the Association, and attend the same. He shall keep fair and accurate records of all the proceedings and orders of the Association; and shall give notice to the several officers, and to the Executive and other committees, of all votes, orders, resolves, and proceedings of the Association, affecting them or appertaining to their respective duties.

TREASURER.

VII. The Treasurer shall collect and take charge of the funds and securities of the Association. Out of these funds he shall pay such sums only as may be ordered by the Association, or by the Executive Committee. He shall keep a true account of his receipts and payments, and at each annual meeting render the same to the Association, when a committee shall be appointed to audit his accounts. If, from the annual report of the Treasurer, there shall appear to be a balance against the treasury, no appropriation of money shall be made for any object but the necessary current expenses of the Association, until such balance shall be paid.

STANDING COMMITTEES.

VIII. There shall be the following standing committees: (1) The Executive Committee, (2) the Advisory Council, (3) the Committee on Publication.

EXECUTIVE COMMITTEE.

IX. The Executive Committee shall consist (1) of the President, First Vice-President, Second Vice-President, Secretary and Treasurer; (2) of six active members, of whom three shall be elected annually by ballot, to serve two years, and who shall be ineligible to reëlection for a second successive term; and (3) of the ex-presidents of the Association.

It shall be the duty of the Executive Committee to consider and recommend plans for promoting the objects of the Association, to authorize the disbursement and expenditure of unappropriated moneys in the treasury for the payment of current expenses; to consider all applications for membership, and at the regular meetings, report the names of such candidates as a majority shall approve; and, generally, to superintend the interests of the Association and execute all such duties as may, from time to time, be committed to them by the Association. At least one month preceding the annual meeting of the Association, the Executive Committee shall cause to be issued to members a notice of such meeting, and they are authorized to publish the same in medical, scientific, and other periodicals, but without expense to the Association; and such notice shall contain the order of business to be followed at said meeting, and, briefly, the subjects to be presented and the special points of discussion.

ADVISORY COUNCIL.

X. The Advisory Council shall consist of one member from each state, territory, and district, the army, navy, and marine hospital service, the Dominion of Canada, and each of the Provinces, who shall be appointed by the President on the last day of each session, and who, besides acting as nominating committee of officers for the ensuing year, to be announced at such time as the Executive Committee may appoint, shall consider such questions and make such recommendations to the Association as shall best secure the objects of the Association. They shall at their first meeting elect from their own number a Secretary, whose record of their proceedings shall be made part of the records of the Association.

COMMITTEE ON PUBLICATION.

XI. The Committee on Publication shall consist of the Secretary and two active members, selected by the Executive Committee, who shall contract for, arrange and publish, under authority of the Executive Committee, the proceedings of the Association, including such

papers as have been examined and approved by the Executive Committee, or which have been submitted to them by the latter for their discretionary action.

REPORTS AND PAPERS.

XII. All committees, and all members preparing scientific reports of papers to be laid before the Association at its annual meetings, must give, in writing, the title of such reports or papers, the time to be occupied in reading them, and an abstract of their contents, to the Executive Committee, at least one week preceding the date of such meeting, to secure their announcement in the order of business.

MEETINGS.

XIII. The time and place of each annual meeting shall be fixed at the preceding annual meeting, but may be changed by the Executive Committee for reasons that shall be specified in the announcement of the meeting. Special meetings may be called at any time or place, by concurrence of two-thirds of the Executive Committee. There shall be no election of officers, or change of By-laws, or appropriation of money to exceed the amount at that time in the treasury, at such special meeting, except by a vote of a majority of all the members of the Association. Whenever a special meeting is to be held, at least one month's notice shall, if possible, be given by circular to all the members, together with the order of business.

QUORUM.

XIV. At the annual meeting nine members shall constitute a quorum for the election of officers, a change of the constitution, the election of members, and the appropriation of moneys.

ORDER OF BUSINESS.

XV. The order of business at all meetings of the Association shall be fixed by the Executive Committee, and such order must be completed before any other business is introduced, except such order of business is suspended by a vote of four-fifths present.

ALTERATION OF CONSTITUTION.

XVI. No alteration in the constitution of the Association shall be made except at an annual meeting, or unless such alteration shall have been proposed at a previous meeting, and entered on the minutes with the name of the member proposing the same, and shall be adopted by a vote of two-thirds of the members present.

BY-LAWS OF THE EXECUTIVE COMMITTEE.

QUORUM.

1. Five members shall constitute a quorum for the transaction of such business as may come before the committee.

MEMBERS RESTRICTED.

2. No Elective member of the Executive Committee shall be at the same time a member of the Advisory Council, if there is another member of the Association from his state or service.

PARLIAMENTARY USAGE.

3. Cushing's Law and Practice of Legislative Assemblies shall be the guide of parliamentary practice until otherwise ordered.

PAPERS.

4. All papers presented to the Association must be either printed, typewritten, or in plain handwriting, and be in the hands of the Secretary at least twenty days prior to the annual meeting, to insure their critical examination as to their fulfilling the requirements of the Association.

5. If any paper is too late for critical examination, said paper may be so far passed upon by the Executive Committee as to allow its reading, but such paper shall be subject to publication or non-publication, as the Executive Committee deem expedient.

6. All papers accepted by the Association, whether read in full, by abstract, by title, or filed, shall be delivered to the Secretary as soon as thus disposed of, as the exclusive property of the Association. Any paper presented to this Association and accepted by it shall be refused publication in the transactions of the Association, if it be published, in whole or in part, by permission or assent of its author, in any manner prior to the publication of the volume of transactions, unless written consent is obtained from the Publication Committee.

7. Day papers shall be limited to twenty minutes, and evening papers to thirty minutes each.

DISCUSSION OF PAPERS.

8. After the leading papers on each subject, as indicated by the Executive Committee, have been read, discussion shall follow, and be confined strictly to the subject of these papers; and each speaker shall

be limited to ten minutes, and shall not speak a second time until after every other member who desires to be heard, and then only for five minutes, except by unanimous consent.

9. The Chair shall notify gentlemen who desire to speak to send up their names, and they shall be called on in the order sent up; and he may, at his discretion, limit the time of speaking to five instead of ten minutes, if in his judgment it may become necessary to do so in order to allow each one on the list an opportunity to be heard.

PUBLICATION COMMITTEE.

10. The Committee on Publication, charged with the duties of selecting and printing the papers and transactions of the Association, shall consist of three active members of the Association, and of whom one shall be the Secretary, appointed by the Executive Committee during the session of the Association, and selected with reference to their facilities of meeting.

11. All papers read by title, and others not definitely passed upon by the Executive Committee, shall be referred to the Publication Committee for critical examination; and said committee is authorized to reject such papers as in its judgment are not worthy of publication, and to omit such others as cannot be included within the limits of the annual volume.

12. The Publication Committee shall procure a copyright on the transactions in the name of the Association, and the committee shall have full charge of the publication of the transactions.

APPLICATION FOR MEMBERSHIP.

13. All applications for membership must be made upon the application blank of the Association.

14. Persons not members, having prepared papers to be presented at the meetings of the Association, shall be proposed for membership at the first business meeting of the Association.

EXPENDITURES.

15. All bills connected with the publication of the transactions shall, upon the approval of the chairman of the Publication Committee and the Secretary, be signed by the President of the Association, and paid by check of the Treasurer directly to the party concerned; and the President shall not approve any bill, relating either to publishing or printing, without the approval first of the chairman of the committee in charge thereof.

16. Bills for current expenses shall be first approved by the Secretary, then sent to the President, and on his approval they shall be paid by check of the Treasurer directly to the parties interested.

17. The actual and necessary traveling expenses of the Secretary and Treasurer to the annual meeting of the Association, and to one meeting of the Executive Committee, shall be classed as current expenses.

RESOLUTIONS.

18. All resolutions presented to the Association shall be sent to the Chair in writing, and referred to a committee without discussion.

ARREARAGES.

19. The arrearages of all members remitting their dues for two years shall be cancelled up to the date of the last payment, but they shall be entitled to the transactions of the Association only for the years for which they have actually paid.

AUDITING COMMITTEE.

29. An Auditing Committee shall be appointed by the Chair to audit the accounts of the Treasurer, and report upon the same.

OFFICERS AND COMMITTEES

OF THE

AMERICAN PUBLIC HEALTH ASSOCIATION.

OFFICERS, 1898–1899.

President.....Dr. GEORGE H. ROHÉ, Sykesville, Md.
First Vice-President.....Dr. HENRY MITCHELL, Asbury Park, N. J.
Second Vice-President.....Dr. JÉSUS E. MONJARÁS, San Luis Potosi, Mex.
Secretary.....Dr. C. O. PROBST, Columbus, Ohio.
Treasurer.....Dr. HENRY D. HOLTON, Brattleboro, Vt.

EX-PRESIDENTS OF THE ASSOCIATION.

Prof. STEPHEN SMITH.....New York City.
Deputy Surgeon-General JOHN S. BILLINGS.....U. S. Army.
Prof. ROBERT C. KEDZIE.....Lansing, Mich.
Medical Director ALBERT L. GIHON..... U. S. Navy.
Dr. HENRY P. WALCOTT.....Cambridge, Mass.
Surgeon General GEORGE M. STERNBERG..... U. S. Army.
Dr. CHARLES N. HEWITT.....Red Wing, Minn.
Dr. HENRY B. BAKER.....Lansing, Mich.
Dr. FREDERICK MONTIZAMBERT.....Quebec, P. Q.
Dr. FELIX FORMENTO.....New Orleans, La.
Dr. SAMUEL H. DURGIN..... Boston, Mass.
Dr. E. P. LACHAPELLE..... Montreal, P. Q.
Dr. WILLIAM BAILEY..... Louisville, Ky.
Dr. EDUARDO LICÉAGA.....Mexico, Mex.
Dr. HENRY B. HORLBECK..... Charleston, S. C.
Dr. CHARLES A. LINDSLEY..... New Haven, Conn.

EXECUTIVE COMMITTEE.

(The Officers and ex-Presidents are *ex-officio* members of the Executive Committee.)

[ELECTIVE.]

Prof. F. C. ROBINSON.....Brunswick, Me.
Dr. P. H. BRYCE..... Toronto, Ont.
Dr. GREGORIO MENDIZABAL..... Orizaba, Mex.
Dr H. M. BRACKEN..... Minneapolis, Minn.
Dr. IRVING A. WATSON.....Concord, N. H.
Dr. FRANK W. WRIGHT..... New Haven, Conn.

ADVISORY COUNCIL.

UNITED STATES:	
Alabama.....	
Arkansas.....	
California.....	Dr. J. R. LAINE, *Sacramento.*
Colorado.....	Dr. BURTON B. GROVER, *Colorado Springs.*
Connecticut.....	Dr. FRANK W. WRIGHT, *New Haven.*
Delaware.....	Mr. W. C. R. COLQUHOUN, *Wilmington.*
Florida.....	Dr. JOSEPH Y. PORTER, *Key West.*
Georgia.....	Dr. WILLIAM F. BRUNNER, *Savannah.*
Illinois.....	Dr. ADOLPH GEHRMANN, *Chicago.*
Indiana.....	Dr. J. N. HURTY, *Indianapolis.*
Iowa.....	Dr. J. F. KENNEDY, *Des Moines.*
Kansas.....	
Kentucky.....	Dr. WILLIAM BAILEY, *Louisville.*
Louisiana.....	Dr. C. P. WILKINSON, *New Orleans.*
Maine.....	Prof. FRANKLIN C. ROBINSON, *Brunswick.*
Maryland.....	Dr. C. H. JONES, *Baltimore.*
Massachusetts.....	Dr. S. H. DURGIN, *Boston.*
Michigan.....	Dr. CRESSY L. WILBUR, *Lansing.*
Minnesota.....	Dr. HENRY M. BRACKEN, *Minneapolis.*
Mississippi.....	
Missouri.....	WILLIAM C. TEICHMANN, Ph. D., *St. Louis.*
Nebraska.....	
New Hampshire.....	Dr. IRVING A. WATSON, *Concord.*
New Jersey.....	Dr. JOHN LAINY LEAL, *Paterson.*
New Mexico.....	Dr. WILLIAM C. BAILEY, *Las Vegas.*
New York.....	Dr. A. WALTER SUITER, *Herkimer.*
North Carolina.....	Dr. S. W. BATTLE, *Asheville.*
North Dakota.....	Dr. FRANCOIS H. DE VAUX *Valley City.*
Ohio.....	Dr. R. D. KAHLE, *Lima.*
Oklahoma Territory..	
Pennsylvania.....	Mr. CROSBY GRAY, *Pittsburg.*
Rhode Island.....	Dr. GARDNER T. SWARTS, *Providence.*
South Carolina.....	Dr. H. B. HORLBECK, *Charleston.*
South Dakota.....	Dr. DELORME W. ROBINSON, *Pierre.*
Tennessee.....	
Texas.....	
Vermont.....	Dr. Jo H. LINSLEY, *Burlington.*
Virginia.....	
Washington.....	Dr. JAMES B. EAGLESON, *Seattle.*
West Virginia.....	
Wisconsin.....	Dr. URANUS O. B. WINGATE, *Milwaukee.*
District of Columbia.	Dr. WILLIAM C. WOODWARD, *Washington, D. C.*
U. S. Army.....	Dr. CHARLES SMART, *Washington, D. C.*
U. S. Navy.....	Medical Director THOS. C. WALTON, *New York City.*
U. S. M. H. Service..	Surg. P. H. BAILHACHE, *Stapleton, Staten Island, N. Y*
CANADA:	
Dominion of Canada..	Dr. FREDERICK MONTIZAMBERT, *Quebec.*
Province of Ontario..	Dr. PETER H. BRYCE, *Toronto.*
Province of Quebec..	Dr. E. P. LACHAPELLE, *Montreal.*

Manitoba..... Dr. James Patterson, *Winnipeg.*
New Brunswick..... Dr. George E. Coulthard, *Fredericton.*
Nova Scotia..... Dr. A. P. Reid, *Halifax.*

Mexico:

Aguas Calientes..... Dr. Augustin Chacon, *Mexico, D. F.*
Campeche..... Dr. Patricio Frueba, *Campeche.*
Colima..... Dr. Miguel Brava, *Colima.*
Coahuila..... Dr. David Cerna, *Saltillo.*
Chihuahua..... Dr. Miguel Marques, *Chihuahua.*
Chiapas..... Dr. Tomas Noriega, *Mexico, D. F.*
Durango..... Dr. Carlos Santa Maria, *Durango.*
Guanajuato..... Dr. Eduardo Licéaga, *Mexico, D. F.*
Guerrero..... Dr. Jose Donaciano Morales, *Mexico, D. F.*
Hidalgo..... Dr. Alfonso Ruiz Erdozain, *Hidalgo.*
Jalisco..... Dr. Salvador Garciadiego, *Guadalajara.*
Michoacán..... Dr. Francisco Iturbide, *Morelia.*
Morelos..... Dr. Angel Gavino, *Mexico, D. F.*
Mexico..... Dr. Roman Ramirez, *Mexico, D. F.*
Nuevo León..... Dr. Amado Fernandez, *Monterey.*
Oxaca..... Dr. Francisco Bernaldez, *Mexico, D. F.*
Puebla..... Dr. Francisco Martinez Baca, *Puebla.*
Querètaro..... Dr. Manuel Septien, *Mexico, D. F.*
San Luis Potosi..... Dr. Joaquin Delgado, *San Luis Potosi.*
Sonora..... Dr. Alberto G. Noriega, *Hermosillo.*
Sinaloa..... Dr. Leopoldo Ortega, *Mazatlan.*
Tabasco..... Dr. Juan Muldson, *Tabasco.*
Tamaulipas..... Dr. Juan F. de la Garza, *Laredo.*
Tlaxcala..... Dr. Rafael Loaiza, *Tlaxcala.*
Veracruz..... Dr. Gregorio Mendizabal, *Orizaba.*
Yucatan..... Dr. Jose Ramirez, *Mexico.*
Zacatecas..... Dr. Juan Breña, *Zacatecas.*
Territorio de la Baja Cali Dr. Tobias Nunez, *Mexico, D. F.*
Territorio de Tepic.... Dr. Carlos Fenelon, *Tepic.*
Distrito Federal..... Dr. Jose Ramirez, *Mexico, D. F.*

PUBLICATION COMMITTEE.

Dr. C. O. Probst.....Columbus, Ohio.
Mr. Josiah Hartzell.....Canton, Ohio.
Dr. Irving A. Watson.....Concord, N. H.

SPECIAL COMMITTEES:

THE POLLUTION OF WATER-SUPPLIES.

Deputy Surgeon-General Charles Smart, U. S. A.....Washington, D. C.
George W. Fuller, Esq.....Cincinnati, Ohio.
Dr. Wyatt Johnston.....Montreal, P. Q.
Dr. José Ramirez.....Mexico, Mex.
Dr. A. C. Abbott.....Philadelphia, Pa.
Prof. Floyd Davis.....De Moines, Iowa.
Dr. Henry Leffman.....Philadelphia, Pa.
Dr. John L. Leal.....Paterson, N. J.

THE DISPOSAL OF GARBAGE AND REFUSE.

Rudolph Hering, C. E.....New York City.
Dr. Benjamin Lee.....Philadelphia, Pa.
Dr. J. A. Beaudrey.....Montreal, P. Q.
Dr. José Ramirez.....Mexico, D. F.
Mr. W. C. R. Colquhoun.....Wilmington, Del.

ANIMAL DISEASES AND ANIMAL FOOD.

D. E. Salmon, D. V. M.....Washington, D. C.
Dr Henry N. Avery.....Minneapolis, Minn.
Prof. José L. Gomez.....Mexico, Mex.
Dr. C. N. Hewitt.....Red Wing, Minn.
Dr. Henry M. Bracken.....Minneapolis, Minn.

CAR SANITATION.

Prof. S. H. Woodbridge.....Boston, Mass.
Dr. Granville P. Conn.....Concord, N. H.
Dr. J. J. Kinyoun, U. S. M. H. S.....Washington, D. C.
Dr. Domingo Orvañanos.....Mexico, Mex.
Dr. John N. Hurty.....Indianapolis, Ind.

THE ETIOLOGY OF YELLOW FEVER.

Dr. H. B. Horlbeck.....Charleston, S. C.
Dr. Felix Formento.....New Orleans, La.
Surgeon-General George M. Sternberg, U. S. A.....Washington, D. C.
Dr. Eduardo Licéaga.....Mexico, Mex.
Dr. Manuel Carmona y Valle.....Mexico, Mex.
Dr. Samuel R. Olliphant.....New Orleans, La.
Supervising Surgeon-General Walter Wyman.....Washington, D. C.
Dr. Alvah H. Doty.....New York, N. Y.

STEAMSHIP AND STEAMBOAT SANITATION.

Dr. Frederick Montizambert.....Quebec, P. Q.
Medical Director Albert L. Gihon, U. S. N.....New York City.
Dr. S. H. Durgin.....Boston, Mass.
Dr. Alvah H. Doty.....New York, N. Y.

THE RELATION OF FORESTRY TO THE PUBLIC HEALTH.

Prof. Wm. H. Brewer.....New Haven, Conn.
Dr. Juan Breña.....Zacatecas, Mex.
Dr. John W. Coventry.....Windsor, Ont.
Dr. James B. Eagleson.....Seattle, Wash.

DEMOGRAPHY AND STATISTICS IN THEIR SANITARY RELATION.

Dr. Cressy L. Wilbur.....Lansing, Mich.
Dr. Charles V. Chapin.....Providence, R. I.
Dr. John S. Fulton.....Baltimore, Md.
Dr. H. M. Bracken.....Minneapolis, Minn.
Dr. A. G. Young.....Augusta, Me.

THE CAUSE AND PREVENTION OF INFECTIOUS DISEASES.

Dr. Peter H. Bryce.....Toronto, Ont.
Surgeon-General George M. Sternberg, U. S. A.....Washington, D. C.
Dr. J. J. Kinyoun, U. S. M. H. S.....Washington, D. C.
Dr. Jésus E. Monjarás.....San Luis Potosi, Mex.
Dr. C. N. Hewitt.....Red Wing, Minn.
Dr. A. Walter Suiter.....Herkimer, N. Y.
Dr. Wyatt Johnston.....Montreal, P. Q.
Dr. Frank W. Wright.....New Haven, Conn.

PUBLIC HEALTH LEGISLATION.

Dr. Henry P. Walcott.....Boston, Mass.
Dr. J. N. McCormack.....Bowling Green, Ky.
Dr. Henry B. Baker.....Lansing, Mich.
Dr. Samuel R. Olliphant.....New Orleans, La.
Dr. Benjamin Lee.....Philadelphia, Pa.
Dr. U. O. B. Wingate.....Milwaukee, Wis.
Dr. C. O. Probst.....Columbus, O.
Dr. E. P. Lachapelle.....Montreal, P. Q.
Dr. Gregorio Mendizabal.....Orizaba, Mex.
Dr. J. A. Albright.....Nashville, Tenn.
Dr. James Patterson.....Winnipeg, Manitoba.
Dr. Henry D. Holton.....Brattleboro, Vt.

THE PERIOD DURING WHICH EACH CONTAGIOUS DISEASE IS TRANSMISSIBLE AND THE LENGTH OF TIME FOR WHICH EACH PATIENT IS DANGEROUS TO THE COMMUNITY.

Dr. Eduardo Licéaga.....Mexico, Mex.
Dr. John L. Leal.....Paterson, N. J.
Surgeon Fernando Lopez.....Mexico, Mex.
Dr. J. J. Kinyoun, U. S. M. H. S.....Washington, D. C.

THE CAUSE AND PREVENTION OF INFANT MORTALITY.

Dr. Ernest Wende.....Buffalo, N. Y.
Dr. Baxter T. Smelzer.....Albany, N. Y.
Dr. John W. Coventry.....Windsor, Ont.
Dr. Manuel Septien.....Quarètaro, Mex.

SANITATION, WITH SPECIAL REFERENCE TO DRAINAGE, PLUMBING, AND VENTILATION OF PUBLIC AND PRIVATE BUILDINGS.

Mr. John Mitchell.....New York City.
Dr. Miguel Marquez.....Chihuahua, Mex.
Mr. Crosby Gray.....Pittsburg, Pa.
Dr. James Campbell.....Hartford, Conn.
Dr. C. Hampson Jones.....Baltimore, Md.

COMMITTEE TO CONSIDER AND REPORT UPON SOME METHOD OF INTERNATIONAL ARRANGEMENT FOR PROTECTION AGAINST THE TRANSMISSION OF INFECTIOUS DISEASES.

Dr. Stephen Smith.....New York City.
Dr. Frederick Montizambert.....Quebec, P. Q.
Dr. J. J. Kinyoun, U. S. M. H. S.....Washington, D. C.
Dr. Eduardo Licéaga.....Mexico, Mex.
Dr. Felix Formento.....New Orleans, La.

DISINFECTANTS.

Prof. F. C. Robinson.....Brunswick, Me.
Dr. Wyatt Johnston.....Montreal, P. Q.
Dr. Alvah H. Doty.....New York, N. Y.
Dr. George M. Sternberg, U. S. A.....Washington, D. C.
Dr. Eduardo Licéaga.....Mexico, Mex.
Dr. H. W. Hill.....Boston, Mass.

TO EXAMINE INTO THE EXISTING SANITARY MUNICIPAL ORGANIZATIONS OF THE COUNTRIES BELONGING TO THE ASSOCIATION, WITH A VIEW TO REPORT UPON THOSE MOST SUCCESSFUL IN PRACTICAL RESULTS.

Dr. Henry Mitchell.....Asbury Park, N. J.
Dr. Charles V. Chapin.....Providence, R. I.
Dr. Domingo Orvañanos.....Mexico, Mex.
Dr. John Sweetland.....Ottawa, Ont.
Dr. W. C. Woodward.....Washington, D. C.

COMMITTEE ON LABORATORIES.

Dr. Wyatt Johnston.....Montreal, P. Q.
(With power to select associates.)

TO DEFINE WHAT CONSTITUTES AN EPIDEMIC.

Dr. U. O. B. Wingate.....Milwaukee, Wis.
Dr. Benjamin Lee.....Philadelphia, Pa.
Dr. Charles V. Chapin.....Providence, R. I.
Dr. Frederick Montizambert.....Quebec, P. Q.
Dr. George H. Rohé.....Baltimore, Md.

ON NATIONAL LEPER HOME.

Dr. H. M. Bracken.....St. Paul, Minn.
Dr. Henry B. Horlbeck.....Charleston, S. C.
Dr. José Ramirez.....Mexico, D. F.
Dr. C. P. Wilkinson.....New Orleans, La.
Dr. Geo. E. Coulthard.....Fredericton, N. B.

COMMISSIONS ON REVISION OF CLASSIFICATION OF DISEASES.

FOR THE UNITED STATES:

Dr. S. W. ABBOTT.....Wakefield, Mass.
Dr. C. L. WILBUR.....Lansing, Mich.
Dr. A. G. YOUNG.....Augusta, Me.

FOR CANADA:

Dr. PETER H. BRYCE.....Toronto, Ont.
Dr. E. P. LACHAPELLE.....Montreal, P. Q.
Dr. E. PELLETIER.....Montreal, P. Q.

FOR MEXICO:

Dr. EDUARDO LICÉAGA.....Mexico, Mex.
Dr. JOSÉ RAMIREZ.....Mexico, D. F.
Dr. JÉSUS E. MONJARÁS.....San Luis Potosi, Mex.

COMMITTEE ON DANGERS TO THE PUBLIC HEALTH FROM ILLUMINATING GAS LEAKAGE.

Dr. S. H. DURGIN.....Boston, Mass.

(With authority to select associates.)

CHAIRMAN LOCAL COMMITTEE OF ARRANGEMENTS.

Dr. R. O. BEARD.....Minneapolis, Minn.

LIST OF MEMBERS

AMERICAN PUBLIC HEALTH ASSOCIATION,

REVISED TO 1898.

This list includes those who have maintained their membership to the present time. The Secretary should be notified of any errors or omissions.

MEMBERS.

ABBOTT, SAMUEL W., M. D.	Wakefield, Mass.	1882
ABBOTT, ALEX C., M. D., University of Pa.	Philadelphia, Pa.	1897
ADAMI, J. GEORGE, M. D.	Montreal, P. Q.	1893
ADAMS, CHARLES EVERETT, M. D.	29 W. Broadway, Bangor, Me.	1894
ADAMS, J. F. A., M. D.	Pittsfield, Mass.	1881
ALDEN, C. H., U. S. A.	Washington, D. C.	1887
ALEXANDER, EDWARD, M. D.	El Paso, Tex.	1892
ALLEN, THOMAS G., M. D.	439 Elk St., Buffalo, N. Y.	1896
ALVAREZ, MAXIMILIAN, M. D.	Toluca, Mex.	1896
ALWARD, MISS MARY B.	55 Johnson Park, Buffalo, N. Y.	1896
ANDERSON, B. P., M. D.	Colorado Springs, Col.	1895
ANDERSON, JOHN A., M. D.	Lambertville, N. J.	1887
ANDERS, H. S., M. D.	1836 Walnut St., Philadelphia, Pa.	1897
ANTHONY, SCOTT J.	Denver, Col.	1895
AQUILOZ, PONCIANO, C. E.	Guanajuato, Mex.	1897
ARMSTRONG, S. T., M. D.	New Rochelle, N. Y.	1892
ARNOLD, CHARLES DAVIS, M. D.	Oklahoma, O. T.	1897
ARTHUR, W. H., M. D.	226 S. 38th St., Philadelphia, Pa.	1897
ATWOOD, JAMES W.	1632 Arch St., Philadelphia, Pa.	1897
ARWINE, J. S., M. D.	Columbus, Ind.	1882
ATKINSON, Hon. EDWARD	Boston, Mass.	1889
AVERY, HENRY NEWELL, M. D.,	2548 Nicollet Ave., Minneapolis, Minn.	1895
AYALA, MELCHOR, Sr.	Guanajuato, Mex.	1896
BACA, FRANCISCO MARTINEZ, M. D.	Puebla, Puebla, Mex.	1892
BACON, MORGAN L., M. D.	Main St., Wellsboro, Pa.	1896
BAILEY, WILLIAM, M. D.	Louisville, Ky.	1879
BAILEY, WILLIAM C., M. D.	614 Walnut St., Las Vegas, N. M.	1892
BAILHACHE, P. H., M. D., U. S. M. H. S.	Stapleton, N. Y.	1874
BAKER, HENRY B., M. D.	Lansing, Mich.	1873
BANCROFT, F., M. D.	Denver, Col.	1887
BANCROFT, F. J., M. D.	397 Grant Ave., Denver, Col.	1895
BARCENA, MARIANO, Sr.	Mexico, Mex.	1892
BARNES, HENRY JABEZ, M. D.	429 Beacon St., Boston, Mass.	1896
BARRETT, FELIX, M. D.	Westbrook, Me.	1894
BARTLETT, JAMES W.	Dover, N. H.	1888
BARTLEY, ELIAS HUDSON, M. D.	21 Lafayette Ave., Brooklyn, N. Y.	1890
BATTLE, SAMUEL W., M. D., U. S. A.	Asheville, N. C.	1887

BEAUDREY, J. A., M. D.....65 St. Denis St., Montreal, P. Q. 1889
BECKER, FREDERICK, M. D.....Clermont, Iowa. 1889
BECKWITH, D. H., M. D.....Cleveland, Ohio. 1884
BEEBE, HENRY E., M. D.....Sidney, Ohio. 1882
BELL, A. N., M. D.....337 Clinton St., Brooklyn, N. Y. 1872
BELLROSE, NORMAN W., M. D.....Eaton, Col. 1895
BENITZ, J. M., M. D.....Guadalajara, Jalisco, Mex. 1892
BENOIT, EMMANUEL PERSILLIER, M. D.
476 Sherbrooke St., Montreal, P. Q. 1894
BERGEY, DAVID H., M. D.....34th and Locust Sts., Philadelphia, Pa. 1894
BERNALDEZ, FRANCISCO, M. D.....Estampa-Merced 5, Mexico, Mex. 1892
BESHOAR, MICHAEL, M. D.....Trinidad, Col. 1895
BILLINGS, JOHN S., M. D., U. S. A..40 Lafayette Place, New York City. 1872
BISHOP, WILLIAM T., M. D.....Harrisburg, Pa. 1889
BLACK, WILLIAM G.....Ottawa, Canada. 1897
BLACKWELL, EMILY, M. D.....53 E. 20th St., New York City. 1873
BOWERS, ABRAHAM H., M. D.....5 East 2d St., Jamestown, N. Y. 1896
BOYD, ELMER THOMAS, M. D.....Leadville, Col. 1895
BRACKEN, HENRY MARTYN, M. D..1010 Fourth St., Minneapolis, Minn. 1895
BRADLEY, HARRY E., M. D.....208 Wisconsin St., Milwaukee, Wis. 1895
BRAUNNAGEL, JULIUS, M. D.....250 So. Laredo St., San Antonio, Tex. 1890
BRAVA, CARLOS, M. D.....Colimo, Mex. 1896
BRAY, CHARLES W., M. D.....Portland, Me. 1894
BRAYTON, SARAH H., M. D.....Evanston, Ill. 1893
BREWER, Prof. WILLIAM H., M. D.....New Haven, Conn. 1874
BRIGGS, ALEXANDER B., M. D.....Ashaway, R. I. 1895
BRIMBLECOM, JOHN C.....West Newton, Mass. 1896
BROWN, A. A., M. D.....Montreal, P. Q. 1894
BROWN, A. H., M. D.....7 Williams St., Auburn, N. Y. 1896
BROWN, H. D., M. D.....79 Market St., Potsdam, N. Y. 1896
BROWN, JOSEPH O.....Pittsburg, Pa. 1888
BRUMBAUGH, GAIUS M., M. D., M. Sc.,
904 Mass. Ave., Washington, D. C. 1896
BRUNNER, WILLIAM FRANCIS, M. D.....50 Harris St., Savannah, Ga. 1890
BRYCE, PETER H., M. D.....Toronto, Ont. 1883
BUCK, ERASTUS J., M. D.....Platteville, Wis. 1888
BURRAGE, SEVERANCE, S. B.....Lafayette, Ind. 1897
BURNS, R. G., M. D.....72 Ohio St., Alleghany, Pa. 1897
BUXTON, L. HAYNES, M. D.....Guthrie, O. T. 1897

CAMERON, ALLEN, M. D.....Owen Sound, Ont. 1886
CAMERON, J. CHALMERS, M. D.....941 Dorchester St., Montreal, P. Q. 1894
CAMPBELL, E. R., M. D.....Bellows Falls, Vt. 1894
CAMPBELL, JAMES, M. D.....Hartford, Conn. 1888
CAMPBELL, WILLIAM ROBERTSON, M. D.,
34 Niagara St., Niagara Falls, N. Y. 1896
CANDEE, JAMES WILLIS, M. D.....402 Warren St., Syracuse, N. Y. 1896
CANTWELL, A. W., M. D.....Davenport, Iowa. 1880
CARMONA, LUIS S., M. D.....Mexico, Mex. 1896
CARMONA Y VALLE, MANUEL, M. D.....Mexico, Mex. 1892
CARTER, EDWIN H., M. D.....Des Moines, Iowa. 1896

CATELLIER, LAURENT, M. D.....31 Dauphine St., Quebec, P. Q. 1894
CAVERLY, CHARLES S., M. D.....Rutland, Vt. 1894
CERNA, DAVID, M. D.....Galveston, Tex. 1896
CHACON, AUGUSTIN, M. D.....Ortego 10, Mexico, Mex. 1892
CHAGNON, ELOI PHILIPPE, M. D.....Longue Point, P. Q. 1894
CHAILLE, Prof. STANFORD E.....New Orleans, La. 1874
CHANDLER, Prof. C. F.....Columbia College, New York City. 1872
CHANDLER, DAVID D.....74 No. 7th St., Newark, N. J. 1896
CHAPIN, CHARLES V., M. D.....Providence, R. I. 1886
CHASE, HERMAN L., M. D.....Brookline, Mass. 1895
CHASE, JOHN C., C. E.....Derry, N. H. 1890
CHICO, JÉSUS, M. D...2 Estrella St., Guanajuato City, Guanajuato, Mex. 1891
CHURCH, THOMAS TEASDALE, M. D.....70 E .Main St., Salem, Ohio. 1890
CLARK, HARRY W., Experiment Station.....Lawrence, Mass. 1896
CLARK, JOSEPH C., M. D.....15 Lawreno St., Olean, N. Y. 1896
CLARKE, A. P., M. D.....Cambridge, Mass. 1887
COFFEY, JAMES C.....Worcester, Mass. 1896
COLLINS, C. S., M. D.....Nashua, N. H. 1896
COLQUHOUN, W. C. R.....Wilmington, Del. 1894
COLUMBUS LIBRARY.....Chicago, Ill. 1897
CONN, G. P., M. D.....Concord, N. H. 1875
CONNER, P. S., M. D.....Cincinnati, Ohio. 1884
CONNIFF, ROBERT E., M. D.....Sioux City, Iowa. 1897
COMEGYS, J. P., M. D.....Rock Island, Ill. 1897
CONTRERAS, ANGEL, M. D.....Mesones 7, Puebla, Puebla, Mex. 1892
COOK, RICHARD J.....316 Chestnut St., Philadelphia, Pa. 1897
COPLIN, WILLIAM L.....1419 So. Broad St., Philadelphia, Pa. 1897
CORNELL UNIVERSITY.....Ithaca, N. Y. 1897
CORNISH, AARON, M. D.....155 William St., New Bedford, Mass. 1892
CORWIN, RICHARD W., M. D.....Pueblo, Col. 1895
COULTHARD, GEORGE EDWIN, M. D...18 Carleton St., Federicton, N. B. 1894
COVENTRY, JOHN W., M. D.....Windsor, Ont. 1886
CRAIG, G. G., M. D.....Rock Island, Ill. 1880
CROSS, J. JAMES R., C. E.....68 Broad St., New York City. 1877
CROUCH, HENRY COOPER, M. D.....Denver, Col. 1895
CULLOTON, THOMAS P.....50 N. Clark St., Chicago, Ill. 1895
CUMMINS, WILLIAM M., M. D.....Los Animos, Col. 1895
CURRIER, DAVID M., M. D.....Newport, N. H. 1883
CURTIS, GEORGE FRANCIS, M. D.....West Newton, Mass. 1897
CURTIS, F. C., M. D.....Albany, N. Y. 1883

DALBY, WILLIAM THOMAS, M. D.....Salt Lake City, Utah. 1894
DANIELL, R. P., M. D.....Jacksonville, Fla. 1890
DARR, HIRAM H., M. D.....Caldwell, Tex. 1883
DAVIS, FLOYD, Ph. D.....Des Moines, Ia. 1890
DAVIS, N. S., M. D.....65 Randolph St., Chicago, Ill. 1887
DEAN, WILLIAM H., E. M. A. C....89 West River St., Wilkesbarre, Pa. 1896
DECOURCY, JAMES OSBOURNE, M. D.....St. Liborg, Ill. 1895
DEERY, J., M. D.....Betz Building, Philadelphia, Pa. 1897
DE LA ROCHE, C. P., M. D.....1573 Pine St., Philadelphia, Pa. 1897
DEMING, WILLIAM CHAMPION, M. D.....West Chester, N. Y. 1895

Denison, Charles, M. D.....1625 Logan Ave., Denver, Col. 1895
Dennis, Laban, M. D.....30 Central St., Newark, N. J. 1877
Derby, William P., M. D.....66 Beacon St., Boston, Mass. 1896
de Schweinitz, Emil A., M. D.....Washington, D. C. 1896
DeWitt, C., M. D.....Fort Monroe, Va. 1895
Dickinson, Charles E.....1601 Logan Ave., Denver, Col. 1895
Dinsmoor, S. M., M. D.....Keene, N. H. 1896
Dodge, William E., Jr.....11 Cliff St., New York City. 1874
Doty, Alvah H., M. D.....Staten Island, N. Y. 1896
Doyle, Gregory, M. D.....307 W. Genesee St., Syracuse, N. Y. 1896
Doyle, William H., M. D.....1610 Spruce St., Philadelphia, Pa. 1897
Drown, Thomas M., M. D.....South Bethlehem, Pa. 1887
Dudley, Charles P., M. D.....Altoona, Pa. 1888
Duffield, Samuel P., M. D.....Detroit, Mich. 1891
Dunham, E. K., M. D.....338 26th St., New York City. 1897
Dunham, S. A., M. D.....180 Chippewa St., Buffalo, N. Y. 1896
Dunmire, G. B., M. D.....1618 Spruce St., Philadelphia, Pa. 1897
Durgin, Samuel H., M. D.....12 Beacon St., Boston, Mass. 1875
Dykes, Henry A., M. D.....600 Market St., Chattanooga, Tenn. 1895

Eads, Benjamin Franklin, M. D.....Marshall, Tex. 1892
Eagleson, James B., M. D.....Seattle, Wash. 1896
Edson, P. O'M., M. D.....249 Warren St., Boston, Mass. 1895
Egan, J. A., M. D.....Springfield, Ill. 1897
Ellms, J. W.....1545 Blair Ave., Cincinnati, O. 1897
Ellegood, R. G., M. D.....Concord, Del. 1897
Elsner, John, M. D.....Denver, Col. 1887
Emery, Z. Taylor, M. D.....831 Washington Ave., Brooklyn, N. Y. 1894
Emmert, Joseph M., M. D.....Atlantic, Iowa. 1897
Erskine, James Buddington, M. D.....Colebrook, N. H. 1894
Exline, James W., M. D.....Denver, Col. 1895
Exton, James A., M. D.....75 Beech St., Arlington, N. J. 1897

Fales, Frank L., C. E.....1 Willow St., Boston, Mass. 1893
Farnham, Edwin, M. D.....Cambridge, Mass. 1889
Farquar, A. B., Esq.....York, Pa. 1880
Fenner, Byron.....Westfield, N. Y. 1896
Fenno, Henry Marshall, M. D.....77 W. Main St., Rochester, N. Y. 1892
Fenton, Thomas H., M. D.....1319 Spruce St., Philadelphia, Pa. 1897
Ferguson, F., M. D.....20 W. 38th St., New York City. 1892
Fernandez, J. D., M. D.....Jacksonville, Fla. 1890
Fleischmann, Louis, M. D.....788 Broadway, New York City. 1890
Flick, Lawrence F., M. D.....736 Pine St., Philadelphia, Pa. 1890
Foote, Charles Jenkins, M. D..305 Howard Ave., New Haven, Conn. 1895
Forget, Lucien.....Montreal, P. Q. 1894
Formento, Felix, M. D.....New Orleans, La. 1880
Foster, Eugene, M. D.....Augusta, Ga. 1881
Foster, George S.....Putney, Vt. 1893
Fowler, Joseph, M. D.....141 Delaware Ave., Buffalo, N. Y. 1896
French, C. D., M. D.....Lawrenceville, Ill. 1897
Fries, Albert, M. D.....9 West 82nd St., New York City. 1897

FULLER, GEORGE W.....Walnut Hills, Cincinnati, O. 1892
FULTON, JONATHAN.....136 Park Place, Johnstown, Pa. 1897
FULTON, JOHN S., M. D.....10 South St., Baltimore, Md. 1897

DE GARAY, ADRIAN, M. D.....Mexico, Mex. 1892
DE LA GARZA, JUAN F., M. D.....Laredo, Tamaulipas, Mex. 1896
GABLE, ISAAC C., M. D.....26 South St., York, Pa. 1897
GAYON, JOSÉ P., M. D.....Mexico, Mex. 1897
GARCIADIEGO, SALVADOR, M. D.....Guadalajara, Jalisco, Mex. 1892
GAUNTT, FRANKLIN, M. D.....Burlington, N. J. 1885
GAVIÑO, A., M. D.....Ratas No. 4, Mexico, Mex. 1891
GEDDES, MRS. FREDERICK L.....2105 Putnam St., Chicago, Ill. 1897
GEHRMANN, ADOLPH, M. D.....3816 Ellis St., Chicago, Ill. 1895
GERHARD, WILLIAM PAUL, C. E.....36 Union Sq., New York City. 1880
GERIN, JOHN, M. D.....68 North St., Auburn, N. Y. 1896
GERRISH, FREDERIC H., M. D.....Portland, Me. 1885
GIBBS, Prof. WOLCOTT.....Newport, R. I. 1876
GIFFORD, WILLIS B., M. D.....Attica, N. Y. 1896
GIHON ALBERT L., M. D., U. S. N.....233 5th Ave., New York City. 1876
GOLTRA, JOHN N., M. D.....441 Elmwood Ave., Buffalo, N. Y. 1896
GOODWIN, R. S., M. D.....Thomastown, Conn. 1886
GROFF, GEORGE G., M. D.....Union St., Lewisburgh, Pa. 1894
GRAVES, E. E., M. D.....Penacook, N. H. 1886
GRAY, CROSBY.....Pittsburgh, Pa. 1874
GRAY, HENRY R.....144 St. Lawrence Main, Monteal, P. Q. 1886
GRAY, SAMUEL M., C. E.....174 Weybosset St., Providence, R. I. 1891
GREENE, MARY E., M. D.....Lawrence Ave., Charlotte, Mich. 1896
GREENE, WALTER D., M. D.....385 Jersey St., Buffalo, N. Y. 1896
GRIFFIN, P. HENRY.....North St., Buffalo, N. Y. 1896
GRIFFITH, JEFFERSON D., M. D.....Kansas City, Mo. 1891
GROVER, BURTON B., M. D.....Colorado Springs, Col. 1895
GUILBERT, EDWARD A., M. D.....Dubuque, Iowa. 1890
GUTIERREZ, MANUEL, M. D.....13 Aduana Vieja, Mexico, Mex. 1891

HAGEY, JACOB MOYER, M. D.....Mt. Morris, N. Y. 1892
HALL, WILLIAM R., M. D.....40 King St., Chatham, Ont. 1896
HAMILTON, J. H., M. D.....Richford, Vt. 1891
HANLEY, LAWRENCE G., M. D.....Seneca St., Buffalo, N. Y. 1896
HARRISON, GEORGE WOOD, M. D.....404 Second St., Ashland, Wis. 1896
HART, JAMES A., M. D.....802 N. Nevada Ave., Colorado Springs, Col. 1895
HARTZELL, JOSIAH, Ph. D.....Canton, Ohio. 1895
HASKELL, W. A., M. D.....Alton, Ill. 1883
HAZARD, GEORGE STEVENS, M. D.....Hollis, N. H. 1896
HAZEN, ALLEN, C. E.....220 Broadway, New York City. 1892
HECKARD, M. O., M. D.....1251 W. Madison St., Chicago, Ill. 1897
HEILBURN, LAWRENCE M.....211 W. 46th St., New York City. 1897
HEFFRON, JOHN LORENZO, M. D..448 South Salina St., Syracuse, N. Y. 1894
HENGERER, WILLIAM.....Buffalo, N. Y. 1896
HEBERT, CHARLES P.....Champ de Mars St., Montreal, P. Q. 1894
HERING, RUDOLPH, C. E.....100 William St., New York City. 1878
HERON, J. H., M. D.....Salt Lake City, Utah. 1895

Hershey, Edgar P., M. D.....408 California Building, Denver, Col. 1895
Hewitt, Charles N., M. D.....Red Wing, Minn. 1872
Hibberd, James F., M. D.....Richmond, Ind. 1881
Hicks, Charles A., M. D.....Fall River, Mass. 1897
Hill, G. Everett.....Newport, R. I. 1897
Hill, Hibbert W.....Sudbury and Hawkins Sts., Boston, Mass. 1896
Hill, John W., C. E.....35 Glenn Building, Cincinnati, Ohio. 1896
Hoadley, Carleton E., M. D.....116 Church St., New Haven, Conn. 1896
Hogan, Louise E.....75 W. 12th St., New York City. 1897
Holcombe, Charles Henry, M. D.....Brookline, N. H. 1894
Holt, Erastus Eugene, M. D.....723 Congress St., Portland, Me. 1894
Holton, Henry D., M. D.....Brattleboro, Vt. 1875
Homan, George, M. D.....919 Olive St., St. Louis, Mo. 1879
Hooper, William G., M. D.....Atlantic City, N. J. 1896
Hopkins, Henry R., M. D.....433 Franklin St., Buffalo, N. Y. 1894
Horlbeck, H. B., M. D.....Charleston, S. C. 1880
Horton, Elmer G.....Columbus, O. 1897
Hoskins, Horace D., D. N. S.....3452 Ludlow St., Philadelphia, Pa. 1897
Howe, Lucien, M. D.....183 Delaware Ave., Buffalo, N. Y. 1896
Hoyt, J. Elizabeth, M. D.....85 North State St., Concord, N. H. 1895
Hoyt, Henry F., M. D.....St. Paul, Minn. 1884
Huggins, William Q.....Sanborn, N. Y. 1896
Hughes, J. W.....747 Craig St., Montreal, P. Q. 1894
Hunt, A. Clark, M. D.....Metuchen, N. J. 1888
Hunt, C. C., M. D.....Dixon, Ill. 1889
Hunt, Simeon, M. D.....Warren Ave. and 2d St., E. Providence, R. I. 1896
Hurty, John N., M. D.....29 East Second St., Indianapolis, Ind. 1896

Ingram, Mary de Booy, M. D.....196 Joralemon St., Brooklyn, N. Y. 1896
Irwell, Lawrence, M. A., B. C. L....76 W. Tupper St., Buffalo, N. Y. 1896
Irwin, Fairfax, M. D.....410 Chestnut St., Philadelphia, Pa. 1897

Jackson, Edward, M. D.....McPhee Building, Denver, Col. 1895
Jackson, Edward, M. D.....1633 Locust St., Philadelphia, Pa. 1897
Jackson, Frank S., M. D.....Dunkirk, N. Y. 1896
Jackson, William H., M. D.....38 Main St., Springville, N. Y. 1896
James, Bushrod W., M. D..Cor. 18th and Green Sts., Philadelphia, Pa. 1878
Jenkins, William T., M. D.....New York, N. Y. 1892
Johnson, Wyatt, M. D.....St. James Club, Montreal, P. Q. 1892
Johnson, C. B., M. D.....Champaign, Ill. 1897
Jones, Leander P., M. D.....Greenwich, Conn. 1889
Jones, S. Case, M. D.....21 East Ave., Rochester, N. Y. 1895
Jordan, Edward C., C. E.....31½ Exchange St., Portland, Me. 1886

Kahn, Lee, M. D.....501 Harrison Ave., Leadville, Col. 1894
Keefer, C. H., C. E.....Ottawa, Ont. 1896
Kemper, J. F., M. D.....Valley Junction, Iowa. 1896
Keller, Wilhelm H., M. D.....Stony Point, N. Y. 1896
Kellogg, J. H., M. D.....Battle Creek, Mich. 1878
Kennedy, J. F., M. D.....Des Moines, Iowa. 1885
Karsner, Charles W., M. D.....1320 So. Broad St., Philadelphia, Pa. 1897

Kimball, G. M., M. D.....Concord, N. H. 1886
Kimball, James P., M. D., U. S. A.....Governor's Island, N. Y. 1892
Kingsley, Byron F., M. D.....Cor. Elm and Starr, San Antonio, Tex. 1892
Kinyoun, J. J., M. D., U. S. M. H. S.....Washington, D. C. 1895
Kirkpatrick, Thomas, M. D.....821 Kansas Ave., Topeka, Kan. 1895
Knox, S. P. B., M. D.....912 Anacapa, Santa Barbara, Cal. 1892
Knox, William F., M. D.....McKeesport, Pa. 1887
Knopf, S. A., M. D.....16 W. 95th St., New York City. 1897
Kober, George M., M. D.....1718 Q St., Washington, D. C. 1896
Kuichling, Emil, C. E.....Rochester, N. Y. 1882

Lachapelle, Emmanuel P., M. D.....Montreal, P. Q. 1887
Laine, J. R., M. D.....913 K St., Sacramento, Cal. 1895
Law, Prof. James.....Ithaca, N. Y. 1872
Leal, Alberto.....Guanajuato, Mex. 1897
Leal, John Lainy, M. D.....149 Ellison St., Paterson, N. J. 1891
Learned, John B., M. D.....Florence, Mass. 1889
Lee Benjamin, M. D.....1532 Pine St., Philadelphia, Pa. 1874
Leiter, L. Z., Esq.....P. O. Drawer L, Chicago, Ill. 1876
Leighton, Marshall.....Montclair, N. J. 1897
Lemp, William T.....St. Louis, Mo. 1884
Leroy, Robert, M. D.....Denver, Col. 1895
Lethworth, Hon. William P.....Glen Iris, Portageville, N. Y. 1874
Lewis, Daniel, M. D.....249 Madison Ave., New York City. 1894
Lewis, D. O., M. D.....1628 Market St., Philadelphia, Pa. 1897
Lewis, Francis W., M. D.....1016 Spruce St., Philadelphia, Pa. 1874
Lewis, G. E. Ross.....1912 Logan Ave., Denver, Col. 1895
Lewis, Richard H., M. D.....Raleigh, N. C. 1892
Library of Pratt Institute.....Remsen St., Brooklyn, N. Y. 1897
Licéaga, Eduardo, M. D.....4 San Andres St., Mexico, Mex. 1891
Lilly, Josiah K.....Indianapolis, Ind. 1897
Lindsley, Charles A., M. D.....New Haven, Conn. 1875
Lippert, Moritz, M. D.....Phoenixville, Pa. 1897
Littell, H. H.....Buffalo, N. Y. 1896
Loaiza, Rafael, M. D.....Tlaxcala, Mex. 1896
Locke, Franklin D.....Erie St., Buffalo, N. Y. 1896
Lorek, Thomas, M. D.....Zacatecas, Mex. 1895
Lumsden, W. J., M. D.....Elizabeth City, N. C. 1892

McClellan, Ezra S., M. D.....Saranac Lake, N. Y. 1889
McClelland, J. H., M. D.....5th and Wilkins Ave., Pittsburg, Pa. 1885
McCormack, J. N., M. D.....Bowling Green, Ky. 1880
McCrimmon, Milton, M. D.....Palermo, Ont. 1894
McFarland, Joseph, M. D.,
421 W. Price St., Germantown, Philadelphia, Pa. 1897
McGaillard, Benjamin, M. D.....229 East State St., Trenton, N. J. 1897
McGregor, George Wilbur, M. D.....Littleton, N. H. 1894
McHugh, Peter J., M. D.....Fort Collins, Col. 1895
McKenzie, Thomas H., C. E.....Southington, Conn. 1893
McNeil, J. Henry, M. D.....33 Sheboygan St., Fond du Lac, Wis. 1896

McShane, James Francis, M. D.,
2 So. Patterson Park Ave., Baltimore, Md. 1892
MacDonald, John D., M. D.....28 Duke St., Hamilton, Ont. 1894
Mackenzie, John J., B. A.....Parliament Building, Toronto, Ont. 1894
Mackie, J. M., M. D.....Portage la Prarie, Manitoba. 1896
Macouzet, R., M. D.....Mexico, Mex. 1897
Marks, Solon, M. D.....Milwaukee, Wis. 1876
Marquardt, C. H., M. D.....La Crosse, Wis. 1893
Marquez, Miguel, M. D.....Chihuahua, Chihuahua, Mex. 1892
Marsh, E. J., M. D.....600 Park Ave., Paterson, N. J. 1872
Martin, C. S., M. D.....Chestnut Hill, Philadelphia, Pa. 1897
Mason, Robert S., M. D.....Chester, Pa. 1897
Mason, Prof. William P.....Troy, N. Y. 1897
Masson, Thomas, M. D.....Cape Vincent, N. Y. 1896
Mathews, J. M., M. D.....923 4th St., Louisville, Ky. 1895
Matthews, W. E., M. D.....Johnstown, Pa. 1897
Mead, Daniel Webster, C. E.....Brown Building, Rockford, Ill. 1892
Mead, Julian Augustus, M. D.....Irving St., Watertown, Mass. 1896
Mendizabal, Gregorio, M. D.....Orizaba, Mex. 1893
Mercer, Alfred, M. D.....Syracuse, N. Y. 1886
Miller, Katharine, M. D.....513 Broadway, Lincoln, Ill. 1892
Mitchell, Henry, M. D.....Asbury Park, N. J. 1886
Mitchell, William Francis, M. D.....Lancaster, Mo. 1892
Mohr, Charles, M. D.....1828 Green St., Philadelphia, Pa. 1897
Monjarás, Jésus E., M. D., Cinco de Mayo.....San Luis Potosi, Mex. 1891
Monjeau, C., C. E.....Middletown, Ohio. 1887
Montgomery, John, M. D.....Ardoch, N. D. 1895
Montgomery, L. H., M. D.....70 State St., Chicago, Ill. 1879
Montizambert, Frederick, M. D.....Grosse Isle, Quebec, P. Q. 1885
Moore, Veramus A., M. D.....Ithaca, N. Y. 1896
Morales, José Donaciano, M. D.,
Hospicio San Nicholes 13, Mexico, Mex. 1892
Morgan, David Percy.....117 Wall St., New York. 1885
Morris, John, M. D.....118 E. Franklin St., Baltimore, Md. 1874
Morris, Moreau, M. D.....1093 73d St., New York City. 1896
Morse, William F., S. E.....58 Pine St., New York City. 1889
Mosher, Eliza M., M. D.....Ann Arbor, Mich. 1889
Muldoon, J., M. D.....San Juan Bautista, Tabasco, Mex. 1896
Mulford, Henry K.....412 So. 13th St., Philadelphia, Pa. 1896
Mullen, Alexander, J., Jr., M. D.,
409 Washington St., Michigan City, Mich. 1892
Munn, William P., M. D.....709 Fourteenth St., Denver, Col. 1895
Murray, Robert D., M. D., U. S. M. H. S.....Mobile, Ala. 1872

Nagle, John T., M. D.....47 East 21st St., New York City. 1874
Nash, Herbert M., M. D.....Norfolk, Va. 1878
Neff, J. L., M. D.....Locust St., Philadelphia, Pa. 1897
New York State Library.....Albany, N. Y. 1897
Nesbitt, Beatty, M. D.....Toronto, Ont. 1897
Newell, F. H.....U. S. Geo. Survey, Washington, D. C. 1897
Newton, Wm. K., M. D.....Paterson, N. J. 1883
New York Public Library.....40 Lafayette Place, New York City. 1898

Noriega, Alberto, M. D.....Hermosillo, Sonora, Mex. 1891
Noriega, Tomas, M. D.....Hospital de Jesus, Mexico, Mex. 1892
Nunn, R. J., M. D.....114½ York St., Savannah, Ga. 1881
Nuttall, George H. F., M. D.,
Altonaer Str. 7, Berlin, N. W., Germany. 1891

O'Hara, Michael, M. D.....31 South 16th St., Philadelphia, Pa. 1897
Orton, John G., M. D.....Binghamton, N. Y. 1890
Orvañanos, Domingo, M. D.....25 Chavarria St., Mexico, Mex. 1890
Osborne, E. C.....Princeton, N. J. 1897
Otis, Edward Osgood, M. D..308 Commonwealth Ave., Boston, Mass. 1894

Paddock, Frank K., M. D.....Pittsfield, Mass. 1889
Papineau, Louis Gustave, C. E.....369 St. Denis St., Montreal, P. Q. 1894
Paquin, Paul, D. V. S.....3536 Olive St., St. Louis, Mo. 1891
Parker, T. E., M. D.....Woodbury, N. J. 1897
Parsons, William M., M. D.....Manchester, N. H. 1897
Patterson, James, M. D.....277 Donald St., Winnipeg, Manitoba. 1894
Patton, George Farrar, M. D.....1134 Camp St., New Orleans, La. 1896
Pearson, Leonard, M. D.....Harrisburgh, Pa. 1897
Pease, Herbert D., M. D.....5812 Morris St., Germantown, Pa. 1897
Peck, George, M. D., U. S. N.....926 No. Broad St., Elizabeth, N. J. 1890
Pelletier, Elzear, M. D.....Montreal, P. Q. 1892
Perry, Thomas B., M. D., P. A. Surgeon, U. S. M. H. S.,
San Francisco, Cal. 1896
Pettit, John A., M. D.....519 Swan St., Buffalo, N. Y. 1896
Phelan, Thomas F., M. D.....Orange, N. J. 1897
Pierce, J. S.....Ardmore, Pa. 1897
Plunket, J. D., M. D.....Nashville, Tenn. 1878
Poindexter, J. D., M. D., U. S. A.....Fort Hamilton, N. Y. 1896
Porter, Joseph Y., M. D.....Jacksonville, Fla. 1878
Pratt, Pascal P.....736 Main St., Buffalo, N. Y. 1896
Pray, Susan Remsen, M. D.....191 So. Ninth St., Brooklyn, N. Y. 1896
Pritchard, Maurice, M. D.....Sierra Valley, Cal. 1893
Probst, C. O., M. D.....Columbus, Ohio. 1886

Ramirez, José, M. D.....Plazuela Buena Vista 1626, Mexico, Mex. 1892
Ramsay, Douglas C., M. D.....Mount Vernon, Ind. 1894
Ravenel, M. P., M. D.....Philadelphia, Pa. 1897
Ravenel, William C., M. D.....Charleston, S. C. 1890
Ravold, Armand, M. D.....St. Louis, Mo. 1897
Rawson, Allen A., M. D.....Corning, Ia. 1892
Raymond, Joseph H., M. D....157 Columbia Heights, Brooklyn, N. Y. 1882
Reeve, J. T., M. D.....Appleton, Wis. 1876
Reid, Alex P., M. D.....Halifax, N. S. 1894
Reilly, F. W., M. D.....Room 2, City Hall, Chicago, Ill. 1896
Reyes, Augustin, M. D.....Mexico, Mex. 1892
Reynolds, A. R., M. D.....Chicago, Ill. 1893
Rhawn, William H.....313 Chestnut St., Philadelphia, Pa. 1897
Richards, Edgar.....341 W. 88th St., New York City. 1889
Richards, Mrs. E. H.....Institute Technology, Boston, Mass. 1888

Richardson, Maj. Henry B., C. E.....New Orleans, La. 1880
Richardson, W. L., M. D.....225 Commonwealth Ave., Boston, Mass. 1875
Riddle, George, M. D.....Crystal City, Manitoba. 1895
Rives, William C., M. D.....289 Madison Ave., New York City. 1885
Roberts, Charles F., M. D.....New York City. 1892
Roberts, Hon. James A.....Mooney Building, Buffalo, N. Y. 1896
Roberts, John B., M. D.....1627 Walnut St., Philadelphia, Pa. 1886
Robillard, Adolphe, M. D.....City Hall, Ottawa, Ont. 1896
Robinson, Prof. Franklin C.....Brunswick, Me. 1889
Robinson, John Franklin, M. D.....Manchester, N. H. 1894
Rogers, Francis J., M. D.....Stamford, Conn. 1889
Rohé, George H., M. D.....Sykesville, Md. 1880
Russell, Julia Wallace, M. D.....44 Pleasant St., Concord, N. H. 1892

Sala, E. M., M. D.....1807 5th Ave., Rock Island, Ill. 1896
Salmon, D. E., D. V. M.....Washington, D. C. 1883
Samaniego, Jos A. M. D.....Ciudad Juarez, Chihuahua, Mex. 1892
Sanchez, Francisco, M. D.....Puebla, Puebla, Mex. 1892
Santa-Maria, Carlos, M. D.....Durango, Mex. 1896
Schenck, W. L., M. D.....Topeka, Kan. 1891
Schmid, Henry Ernest, M. D.....White Plains, N. Y. 1896
Schoellkopf, Hon. Arthur.....Niagara Falls, N. Y. 1896
Schoonover, Warren, M. D.....115 East 59th St., New York City. 1895
Schmuck, J. Carl, M. D.....Lawrence, Staten Island. 1897
Scribner, Mrs. John H.....Chestnut Hill, Philadelphia, Pa. 1897
Scull, Henry S., M. D.....Atlantic City, N. J. 1896
Sears, John H., M. D.....Waco, Tex. 1887
Sears, Frederick, M. D.....506 Warren St., Syracuse, N. Y. 1897
Sewall, Henry, M. D.....23 Eighteenth Ave., Denver, Col. 1894
Shakespeare, E. O., M. D.....Rosemont, Pa. 1897
Shenk, W. L., M. D.....New Castle, Col. 1895
Shepard, Charles H., M. D.....Columbia Heights, Brooklyn, N. Y. 1892
Shepherd, George R., M. D.....667 Asylum St., Hartford, Conn. 1886
Shiard, Charles, M. D.....Toronto, Ont. 1896
Shillito, G. M., M. D.....Roup St., Pittsburgh, Pa. 1892
Shrader, John C., M. D.....Iowa City, Iowa. 1890
Shuttleworth, Edward B., M. D...220 Shartowne St., Toronto, Ont. 1895
Silva, M. O., M. D.....Morelia, Mex. 1892
Simmons, H. M., M. D.....209 Park Ave., Baltimore, Md. 1897
Simons, T. Grange, M. D.....Charleston, S. C. 1881
Slee, Richard, M. D.....Swiftwater, Pa. 1897
Smart, Charles, M. D., U. S. A.....Washington, D. C. 1882
Smelzer, Baxter T., M. D.....229 Hamilton St., Albany, N. Y. 1895
Smith, Charles D., M. D.....Portland, Me. 1885
Smith, Frederick W., M. D.....700 S. West St., Syracuse, N. Y. 1896
Smith, J. Sol., M. D.....Denver, Col. 1895
Smith, Joel W., M. D.....Charles City, Ia. 1888
Smith, Stephen, M. D.....640 Madison Ave., New York City. 1872
Smith, T. Guilford.....Ellicott Sq., Buffalo, N. Y. 1896
Somreman, Mariano, M. D.....Guadalajara, Mex. 1897

SPENCER, JAMES D., M. D.....59 Washington St., Watertown, N. Y. 1896
STANDLEE, ELI L., M. D.....2201 University Pl., St. Louis, Mo. 1895
STANTON, BYRON, M. D.....Cincinnati, Ohio. 1889
STAPLES, FRANKLIN, M. D.....Winona, Minn. 1885
STARKWEATHER, RALPH E., M. D.,
Dearborn and Washington Sts., Chicago, Ill. 1879
STEDMAN, ARNOLD, M. D.....722 14th St., Denver, Col. 1895
STERNBERG, GEORGE M., M. D., U. S. A.....Washington, D. C. 1874
STEWART, FRANCIS E., M. D.,
Merck Building, University Place, New York City. 1897
STEWART, A. H., M. D.....252 No. 12th St., Philadelphia, Pa. 1897
STULL, THEODORE B.....City Hall, Philadelphia, Pa. 1897
SUITER, A. WALTER, M. D.....Herkimer, N. Y. 1894
SUTHERLAND, QUINCY ORLIN, M. D..73 Milwaukee St., Janesville, Wis. 1895
SUTTON, H. C., M. D.....220 N. James St., Rome, N. Y. 1896
SWARTS, GARDNER TABER, M. D.....Providence, R. I. 1894
SWOPE, SAMUEL D., M. D.....Deming, N. M. 1895

TALBOT, Miss MARION.....University of Chicago, Chicago, Ill. 1893
TALLEY, ALEXANDER N., M. D.....Columbus, S. C. 1890
TEICHMANN, WILLIAM C., Ph. D.....1141 Market St., St. Louis, Mo. 1896
TEN WERGESY, CHARLES H., M. D.....Wilmington, Del. 1897
TERRILL, H. S., M. D.....Fort Riley, Kan. 1895
THIBAUDEAU, Hon. JOSEPH ROSAIRE,....857 Palace St., Montreal, P. Q. 1894
THOMPSON, J. G., M. D.....Angola, N. Y. 1896
THOMPSON, S. J.....Third Ave., Carbeny, Manitoba. 1896
THOMPSON, WILLIAM, M. D.....1426 Walnut St., Philadelphia, Pa. 1897
THORNTON, G. B., M. D.....Memphis, Tenn. 1879
TOWNE, S. R., M. D.....Omaha, Neb. 1895
TRACY, ROGER S., M. D.....151 W. 106th St., New York City. 1889
TRAVER, LORENZO, M. D.....5 Stewart St., Providence, R. I. 1892
TUCKER, H. G., M. D.....1270 N. Vine St., Nashville, Tenn. 1896
TURNER, THOMAS J., M. D., U. S. N.....Coldwater, Mich. 1877
TURNBULL, LAWRENCE, M. D.....255 So. 17th St., Philadelphia, Pa. 1897
TURNBULL, THOMAS, M. D.....314 Western Ave., Alleghany, Pa. 1897

VALENTINE, FRED C., M. D.....242 West 43d St., New York, N. Y. 1896
VANIER, JOSEPH EMILE, I. C.....107 St. James St., Montreal, P. Q. 1894
VAN NORMAN, E. V., M. D.....Los Angeles, Cal. 1882
VAUGHAN, VICTOR C., M. D.....Ann Arbor, Mich. 1883
VAUX, HARRY E., M. D.....Brockville, Ont. 1894
VEEDER, MAJOR ALBERT, M. D.....12 Queen St., Lyons, N. Y. 1896
VEEDER, ANDREW TRUAX, M. D., Home Office Building, Pittsburg, Pa. 1896
VERGE, W. A., M. D.....Quebec, P. Q. 1894
VINNEDGE, W. W., M. D.....Lafayette, Ind. 1882
VAN BUSKIRK, W. F., C. E.....Stratford, Ont. 1896

WADE, JOHN W., M. D.....318 No. 2d St., Millville, N. J. 1897
WADE, SPENCER S., M. D.....Morgantown, W. Va. 1892
WAKEMAN, B. R., M. D.....73 Main St., Hornellsville, N. Y. 1896
WALCOTT, HENRY P., M. D.....Cambridge, Mass. 1880

WALKER, CHARLES R., M. D.....Concord, N. H. 1894
WALSH, RALPH, M. D.....Washington, D. C. 1885
WALLACE, SHIPPEN, M. D.....113 Walnut St., Burlington, N. J. 1897
WARD, L. B., C. E.....102 St. Nicholas Ave., New York City. 1885
WARDLOW, JAMES S., M. D.....Galt, Ont. 1896
WATSON, IRVING A., M. D.....Concord, N. H. 1881
WATSON, J. MADISON, M. D.....Elizabeth, N. J. 1882
WATT, ALFRED TENNYSON, M. D.....Victoria, B. C. 1896
WEDGEWOOD, MILTON C., M. D.....101 Pine St., Lewiston, Me. 1894
WEIDIG, HENRY P., Ph. D.....Clifford St., Newark, N. J. 1895
WEIDNER, CARL, M. D.....1932 West Jefferson St., Louisville, Ky. 1895
WELCH, WILLIAM, M. D.....821 No. Broad St., Philadelphia, Pa. 1897
WENDE, ERNEST, M. D.....296 Water St., Buffalo, N. Y. 1894
WESBROOK, FRANK F., M. D.....Minneapolis, Minn. 1897
WESTON, ROBERT SPURR.....21 Wyman St., Brockton, Mass. 1896
WHITE, ALFRED T.....40 Remsen St., Brooklyn, N. Y. 1889
WHITE, WILLIAM A., M. D.....P. O. Box 619, New York City. 1888
WHITESIDES, LINDSAY S., M. D.....Franklin, Ind. 1894
WHITMORE, WALTER S., M. D.....17 Broad St., Red Bank, N. Y. 1896
WIELAND, J. W., M. D.....1993 Cowles Ave., Dubuque, Ia. 1894
WILBUR, CRESSY L., M. D.....Lansing, Mich. 1894
WILLIAMS, ANNIE W., M. D.....1235 Vine St., Denver, Col. 1895
WILSON, EZRA H., M. D.....Hoagland Laboratory, Brooklyn, N. Y. 1897
WILSON, G. H., M. D.....50 Colony St., Meriden, Conn. 1890
WILSON, WILLIAM A., M. D.....310 Paris Ave., Grand Rapids, Mich. 1896
WINGATE, URANUS OWEN BRACKETT, M. D.,
204 Biddle St., Milwaukee, Wis. 1890
WINTER, HERMAN, M. D.....Buffalo, N. Y. 1896
WISE, SIMON P., M. D.....Millersburg, Ohio. 1886
WITHROW, JOHN M., M. D.....526 W. 7th St., Cincinnati, Ohio. 1897
WODDROP, L. H.....1458 No. 15th St., Philadelphia, Pa. 1897
WOOD, ALFRED VINCENT.....115 Amherst St., Brunswick, Ga. 1892
WOOD, E. M., M. D.....Winnipeg, Manitoba. 1897
WOOD, Prof. EDWARD S.....Boston, Mass. 1895
WOODBRIDGE, JOHN ELIOT, M. D....637 Prospect St., Cleveland, Ohio. 1896
WOODBRIDGE, Prof. S. H.....Boston, Mass. 1895
WOODCOCK, GALEN MURRAY, M. D.....17 Adams St., Bangor, Me. 1896
WOODHULL, Lieut.-Col. A. A., M. D., U. S. A.....Ft. Monroe, Va. 1874
WOODWARD, C. R.....Cairo, Ill. 1896
WOODWARD, WILLIAM C., M. D.....Washington, D. C. 1896
WORCESTER PUBLIC LIBRARY.....Worcester, Mass. 1897
WORDIN, NATHANIEL EUGENE, M. D.,
174 Fairfield Ave., Bridgeport, Conn. 1890
WRIGHT, A. R., M. D.....Delaware Ave., Buffalo, N. Y. 1896
WRIGHT, FRANK W., M. D.....48 Pearl St., New Haven, Conn. 1889
WRIGHT, JOHN W., M. D.....Erie, Pa. 1897
WROTH, JAMES HENRY, M. D.....Albuquerque, N. M. 1896
WYCKOFF, C. C., M. D.....482 Delaware Ave., Buffalo, N. Y. 1896
WYCKOFF, RICHARD M., M. D.....532 Clinton Ave., Brooklyn, N. Y. 1894
WYMAN, WALTER, M. D., U. S. M. H. S.....Washington, D. C. 1884

YOUNG, A. G., M. D.....Augusta, Me. 1885

ZERTUCHE, EMILIO, M. D.....City of Pueblo, Mex. 1897

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Ex-President GROVER CLEVELAND.....Princeton, N. J. 1885
Dr. J. B. RUSSELL, LL.D.....Glasgow, Scotland. 1886
Mrs. ELIZABETH THOMPSON.....New York City. 1887
President PORFIRIO DIAZ.....Mexico, Mex. 1892

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HENRY LOMB.....Rochester, N. Y. 1884

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BELCOURT, NAPOLEON ANTOINE, Esq.....415 Theodore St., Ottawa, Ontario
BLACK, WM. G.....20 Sparks St., Ottawa, Ontario
BOARDMAN, WILLIAM FREARS.....Ottawa, Ontario
BOSTHWICK, W.....120 Rideau St., Ottawa, Ontario
BRAGG, HARRY.....30 Hospital St., Montreal, P. Q.
BREÑA, Dr. JUAN.....Zacatecas, Mex.
BUCKE, R. M., M. D.....London, Ontario
BURN, GEORGE.....Metcalfe St., Ottawa, Ontario
BURROUGHS, JAMES A., M. D.....Asheville, N. C.

CABANA, LOUIS V., M. D.....1212 No. Main St., Fall River, Mass.
CHANDLER, D. D.....Newark, N. J.
CHURCH, C. R., M. D.....202 Elgin St., Ottawa, Ontario
CLUFF, WILLIAM HAZZARD.....251 Lyon St., Ottawa, Ontario
CONNELL, WALTER THOMAS, M. D.....55 Earl St., Kingston, Ontario
CONNELLY, R. N., M. D.....Newark, N. J.
CONSTANTINEAU, J. A., Priest.....Ottawa, Ontario
COOKE, S. P., M. D.....377 Sparks St., Ottawa, Ontario

ENRIGHT, I. C.....331 Wellington St., Ottawa, Ontario

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HENDERSON, ALEX. ALLAN, M. D.....414 Albert St., Ottawa, Ontario
HERALD, H. C. H., M. D.....Newark, N. J.
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HORETZSKY, CHAS. G., C. E.....No. 88 Bedford Road, Toronto, Ont.

Jacques, F. H. St.....“Russell House,” Ottawa, Ontario
Jones, C. Hampson, M. D.....211 W. Franklin St., Baltimore, Md.

Kahle, R. D., M. D.....237½ N. Main St., Lima, Ohio

Linsley, Jo H., M. D.....Burlington, Vt.
Logan, George, M. D.....126 Albert St., Ottawa, Ontario
Lumsden, Alexander.....Ottawa, Ontario

MacCabe, John Alexander, LL.D.....Ottawa, Ontario
Macfarlane, Thomas.....138 Somerset St., Ottawa, Ontario.
MacTavish, D. B., Esq.....68 Frank St., Ottawa, Ontario
Mather, James.....110 Wellington St., Ottawa, Ontario
May, George S.....74 Rideau St., Ottawa, Ontario
McKinley, Dr. John, S. C.....Ottawa, Ont.
Moore, Wm., D. D.....Ottawa, Ontario

Perley, Mrs. W. G.....MacLaren St., Ottawa, Ontario
Poulin, Stanislas Remi, C. E.....375 Wellington St., Ottawa, Ontario
Powell, C. Berkley, M. D.....283 Metcalfe St., Ottawa, Ontario
Powell, Fred Hamilton, M. D.....240 Concession St., Ottawa, Ontario
Preston, R. H., M. D.....Cor. Metcalfe and Main Sts., Ottawa,Ontario
Provost, L. Coyteux, M. D.....132 Daly Ave., Ottawa, Ontario

Ramirez, Roman, M. D.....Tacubaye St., Mexico, Mexico
Robillard, A.....229 Stewart St., Ottawa, Ontario

Saunders, Wm., M. D.....Experiment Farm, Ottawa, Ontario
Scott, Richard W., Esq.....Ottawa, Ontario
Septien, Dr. Manuel.....Querétaro, Mex.
Shaffer, A. W., C. E.....Raleigh, N. C.
Shutt, Frank Thomas.....Experimental Farm, Ottawa, Ontario
Small, Henry Beaumont, M. D.....150 Maria St., Ottawa, Ontario
Sparks, Miss Sarah.....Kilmington Place, Ottawa, Ontario
St. Jean, Dr. P.....Ottawa, Ont.
Sweetland, John, M. D.....Kilmington Place, Ottawa, Ontario

Utley, Edward R., M. D.....497 Centre St., Newton, Mass.

Valade, Dr. F. X.....Ottawa, Ont.
VanDeren, Clarence T.....Harrison, N. J.

Wilkinson, C. P., M. D.....New Orleans, La.
Wright, H. P., M. D.....196 Elgin St., Ottawa, Ontario

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OF THE

UNITED STATES OF AMERICA, THE DOMINION OF CANADA, AND THE REPUBLIC OF MEXICO.

1899.

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American Public Health Association

The United States of America.

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Preliminary Announcement

Twenty-Seventh Annual Meeting

TO BE HELD AT

MINNEAPOLIS, MINN.,

Tuesday, Wednesday, Thursday, and Friday,

OCTOBER 31, NOVEMBER 1, 2, 3,

1899.

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American Public Health Association.

SECRETARY'S OFFICE.

COLUMBUS, OHIO, March 27, 1899.

The Twenty-Seventh Annual Meeting of the AMERICAN PUBLIC HEALTH ASSOCIATION will be held at Minneapolis, Minn., beginning October 31st and continuing until November 4, 1899.

The Executive Committee has selected the following topics for consideration:

I. The Pollution of Water Supplies.

II. The Disposal of Garbage and Refuse.

III. Animal Diseases and Animal Food.

IV. Car Sanitation.

V. Steamship and Steamboat Sanitation.

VI. The Etiology of Yellow Fever.

VII. The Relation of Forestry to the Public Health.

VIII. Demography and Statistics in Their Sanitary Relations.

IX. The Cause and Prevention of Infectious Diseases.

X. Public Health Legislation.

XI. The Cause and Prevention of Infant Mortality.

XII. The Period During which Each Contagious Disease is Transmissible and the Length of Time for which each Patient is Dangerous to the Community.

XIII. Sanitation, with Special Reference to Drainage, Plumbing and Ventilation of Public and Private Buildings.

XIV. Method of International Arrangement for Protection Against the Transmission of Infectious Diseases.

XV. Disinfectants.

XVI. To Examine into the Existing Sanitary Municipal Organizations of the Countries Belonging to the Association with a View to Report upon those most Successful in Practical Results.

XVII. Laboratories.

XVIII. To Define What Constitutes an Epidemic.

XIX. National Leper Home.

XX. Revision of Classification of Diseases.

XXI. Dangers to the Public Health from Illuminating Gas Leakage.

Upon all the above subjects special committees have been appointed to report.

Papers will be received upon other sanitary subjects.

Regulations Relating to Papers.

(Extract from By-Laws.)

4. All papers presented to the Association must be either printed, typewritten, or in plain handwriting, and be in the hands of the Secretary at least twenty days prior to the annual meeting, to insure their critical examination as to their fulfilling the requirements of the Association.

5. If any paper is too late for critical examination, said paper may be so far passed upon by the Executive Committee as to allow its reading, but such paper shall be subject to publication or non-publication, as the Executive Committee deem expedient.

6. All papers accepted by the Association, whether read in full, by abstract, by title, or filed, shall be delivered to the Secretary as soon as thus disposed of, as the exclusive property of the Association. Any paper presented to this Association and accepted by it shall be refused publication in the transactions of the Association, if it be published, in whole or in part, by permission or assent of its author, in any manner prior to the publication of the volume of transactions, unless written consent is obtained from the Publication Committee.

7. Day papers shall be limited to twenty minutes, and evening papers to thirty minutes each.

DISCUSSION OF PAPERS.

8. After the leading papers on each subject, as indicated by the Executive Committee, have been read, discussion shall follow, and be confined strictly to the subject of these papers; and each speaker shall be limited to ten minutes, and shall not speak a second time until after every other member who desires to be heard, and then only for five minutes, except by unanimous consent.

9. The Chair shall notify gentlemen who desire to speak to send up their names, and they shall be called on in the order sent up; and he may, at his discretion, limit the time of speaking to five instead of ten minutes, if in his judgment it may become necessary to do so in order to allow each one on the list an opportunity to be heard.

10. The Committee on Publication, charged with the duties of selecting and printing the papers and transactions of the Association, shall consist of three active members of the Association, and of whom one shall be the Secretary, appointed by the Executive Committee during the session of the Association, and selected with reference to their facilities of meeting.

11. All papers read by title, and others not definitely passed upon by the Executive Committee, shall be referred to the Publication Committee for critical examination; and said committee is authorized to reject such papers as in its judgment are not worthy of publication, and to omit such others as cannot be included within the limits of the annual volume.

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OF THE

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Dr. George Henry Rohé died on the 6th of February, 1899, at New Albany, Louisiana, while in attendance upon the National Prison Congress as the official representative of the State of Maryland, to which he had been appointed by the Governor of that State.

Under the provisions of the Constitution, Dr. Henry Mitchell, of Asbury Park, New Jersey, has become President of the Association for the unexpired term of Dr. Rohé.

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(The Officers and ex-Presidents are *ex-officio* members of the Executive Committee.)

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